N00164.AR.001813
NSA CRANE
5090.3a

FINAL RCRA FACILITY INVESTIGATION REPORT PCP DIP TANK SOLID WASTE MANAGEMENT UNIT 29 (SWMU29) NSA CRANE IN

7/1/2012

TETRA TECH

FINAL

Resource Conservation and Recovery Act Facility Investigation Report

for the

PCP Dip Tank (SWMU 29)

Naval Support Activity Crane
Crane, Indiana

Naval Facilities Engineering Command Midwest

Contract Number N62470-08-D-1001

Contract Task Order F27N

July 2012

REVISION 0
JULY 2012

FINAL
RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT FOR THE PCP DIP TANK (SWMU 29)

NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Submitted to:
Naval Facilities Engineering Command Midwest
201 Decatur Avenue
Building 1A, Code EV
Great Lakes, Illinois 60088

Submitted by:
Tetra Tech
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406

CONTRACT NUMBER N62470-08-D-1001
CONTRACT TASK ORDER F27N

JULY 2012

PREPARED UNDER THE DIRECTION OF:

JOSEPH H. LUCAS, QEP
PROJECT MANAGER
TETRA TECH
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMISSION BY:

JOHN TREPANOWSKI, PE
PROGRAM MANAGER
TETRA TECH
KING OF PRUSSIA, PENNSYLVANIA

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

SECTION **PAGE NO.**

TABLE OF CONTENTS (Continued)

APPENDICES:

TABLES

NUMBER

TABLES (Continued)

NUMBER

FIGURES

NUMBER

LIST OF ACRONYMS

ºC	degrees Celsius
°F	degrees Fahrenheit
ADAF	Age Dependent Adjustment Factor
amsl	above mean sea level
AR	Administrative Record
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	Biota-soil bioaccumulation factor
BER	baseline ecological risk assessment
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
Cal EPA	California Environmental Protection Agency
CA	Corrective Action
CAS	Chemical Abstracts Service
CCME	Canadian Council of Ministers of the Environment
CDI	Chronic Daily Intake
CEC	Cation Exchange Capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Cape Fear Analytical, LLC
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMS	Corrective Measures Study
cm	square centimeter
COC	chemical of concern
COPC	chemical of potential concern
CSF	Cancer Slope Factor
CSM	conceptual site model
CTE	Central Tendency Exposure
CTO	Contract Task Order
DAF	dependant adjustment factors
DI	deionized
DL	Detection limit
DO	dissolved oxygen
DoD	Department of Defense

DPT	direct-push technology
DRO	Diesel Range Organics
DQI	Data Quality Indicator
DQO	Data Quality Objective
DVM	Data Validation Manager
EcoSSL	Ecological Soil Screening Level
EDD	Electronic Data Deliverable
EDQL	Environmental Data Quality Level
EEQ	Ecological Effect Quotient
ELAP	Environmental Laboratory Accreditation Program
EMR	Environmental Monitoring Reports
EP	Extraction Procedure
EPC	Exposure Point Concentration
EPD	Environmental Protection Department
ERA	Ecological Risk Assessment
ESL	Ecological Screening Level
EU	Exposure Unit
FBL	fixed-based laboratory
FOD	frequency of detection
FOL	Field Operations Leader
FTMR	Field Task Modification Request
GC/MS	Gas Chromatography/Mass Spectroscopy
GPS	Global Positioning System
HASP	Health and Safety Plan
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HSM	Health and Safety Manager
IAC	Indiana Administrative Code
IAS	Initial Assessment Study
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ID	identification
IDEM	Indiana Department of Environmental Management
IDW	investigation-derived waste

IEUBK	Integrated Exposure Uptake Biokinetic Model
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
ISA	Initial Site Assessment
IUR	Inhalation Unit Risk
Kd	soil water partition coefficient
Koc	organic matter water partition coefficient
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LEL	lower exposure limit
LOAEL	Lowest Observed Adverse Effects Level
LOD	Limit of Detection
LOEC	Lowest Observed Effects Concentration
LODV	Limit of Detection Verification
LOQ	Limit of Quantitation
MATC	Maximum Acceptable Toxicant Concentration
MCL	Maximum Contaminant Level
MDL	Minimum Detection Limit
MEQ	milliequivalent
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
MRL	minimum risk level
MS	matrix spike
MSD	matrix spike duplicate
NA	Not Applicable
NAVD88	1988 North American Vertical Datum
NAVFAC	Naval Facilities Engineering Command
NCEA	National Center for Environmental Assessment
NEESA	Naval Energy and Environmental Support Activity
NELAP	National Environmental Laboratory Accreditation Program
NFA	No Further Action
NIRIS	Naval Installation Restoration Information Solution
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observable Adverse Effects Level
NOEC	No Observed Effects Concentration

NSA	Naval Support Activity
NTU	nephelometric turbidity unit
OPPTS	Office of Prevention, Pesticides, and Toxic Substances
ORD	Office of Research and Development
ORNL	Oak Ridge National Laboratory
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAH	polynuclear aromatic hydrocarbon
PAL	Project Action Limit
PCP	pentachlorophenol
PEF	Particulate Emission Factor
PPRTV	Provisional Peer Reviewed Toxicity Value
PID	photoionization detector
PM	Project Manager
POC	Point of Contact
PPE	personal protective equipment
ppm	part per million
PQO	project quality objective
PSL	Project Screening Level
QA/QC	quality assurance/quality control
QAM	Quality Assurance Manager
QAMS	Quality Assurance Management System
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QL	Quantitation Limit
RA	Removal Action
RAGS	Risk assessment Guidance for Superfund
RBCs	Risk-Based Concentrations
RBTL	Risk-Based Target Level
RBSSL	Risk-Based Soil Screening Level
RCRA	Resource Conservation and Recovery Act
RDA	Recommended Daily Allowance
RDI	Recommended Daily Intake
RfC	Reference Concentration
RfD	Reference Doses

RFI	RCRA Facility Investigation
RISC	Risk Integrated System Closure
RME	Reasonable Maximum Exposure
RPD	Relative Percent Difference
RPM	Remedial Project Manager
R-RSL	Residential Regional Screening Level
RSL	Regional Screening Level
RTI	RTI Laboratories, Inc.
%R	Percent Recovery
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SERA	Screening Ecological Risk Assessment
SIM	selected ion monitoring
SOP	Standard Operating Procedure
sq ft	square feet
SSL	Soil Screening Level
SSO	Site Safety Officer
S.U.	Standard Units
SV	screening value
SVOCs	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
TBD	to be determined
TCL	Target Compound List
TEL	Threshold Effects Level
Tetra Tech	Tetra Tech, Inc.
TOM	Task Order Manager
TRVs	toxicity reference values
UCL	Upper Confidence Limit
UFP-SAP	Uniform Federal Policy for Sampling and Analysis Plan
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
µg/kg	microgram per kilogram

EXECUTIVE SUMMARY

This report documents the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for Solid Waste Management Unit (SWMU) 29, Pentachlorophenol (PCP) Dip Tank, located at the Naval Support Activity (NSA), Crane, Indiana. Tetra Tech, Inc. (Tetra Tech) prepared this report for the Naval Facilities Engineering Command (NAVFAC) Midwest under Contract Task Order (CTO) F27N, Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62470-08-D-1001.

PURPOSE OF RFI REPORT

This report presents the results of the RFI process, including a description of the field work, a data presentation, human health and ecological risk assessments and recommendations for future action.

RFI OBJECTIVES

Data collected during the RFI were used to meet the following objectives:

- Determine if concentrations of semi-volatile organic compounds (SVOCs), including polynuclear aromatic hydrocarbons (PAHs), diesel range organics (DRO), and PCP are present, and if they exceed human health and ecological screening-levels.
- Determine the presence and nature of contamination within soil at NSA Crane SWMU 29 PCP Dip Tank.
- Conduct a baseline human health risk assessment (HHRA).
- Conduct a screening-level ecological risk assessment (ERA).
- Prepare a RFI Report for submittal to the Navy.

HISTORICAL INFORMATION

The PCP Dip Tank was located near Building 56 within SWMU 29. It was used for dipping untreated wood into PCP solution (a wood preservative). The tank was operated between 1950 and 1965. NSA Crane personnel reported that the dip tank leaked. However, there was no documentation available indicating the number of leaks, dates, or estimated quantities of PCP that may have leaked from the tank.

The tank was removed in 1965. An Initial Assessment Study (IAS) conducted in 1983 inspected the dip tank location and revealed there is no vegetation stress or evidence to visually confirm the PCP Dip Tank leaked (NEESA, 1983). The IAS found no evidence of a leak and recommended no further action (NFA). In 1987, a Preliminary Review/Site Inspection was conducted and recommended that soil should be sampled in the location of the former tank to verify the conclusions of the IAS Study (A.T. Kearney, 1987). There are no groundwater monitoring wells at SWMU 29.

CONCEPTUAL SITE MODEL

The former PCP Dip Tank was used to treat wooden pallets. It is assumed that PCP solution was released to the environment via tank leaks and/or during process steps that may have allowed PCP solution to drip onto the soil surrounding the tank during removal of the treated wood from the solution. If the leaks were large enough, it is possible that some of the PCP solution could have drained beyond the soil surrounding the tank and down the slope located west of the PCP tank.

After release to surface soil, the PCP solution could have migrated vertically downward during precipitation events into subsurface soil and groundwater, and possibly result in a complete exposure pathway to human receptors that could consume incidental groundwater or soil, or could make direct dermal contact with these media. PCP in surface soil could flow as overland runoff toward areas of lower elevation, especially within existing surface drainage channels. These channels could then transport the contaminants in surface water and sediment to lower elevations within the channels. PCP degrades readily in shallow surface water when exposed to light. So the persistence of PCP is expected to be short under those conditions. PCP impurities and degradation products would exhibit similar fates but dioxins and furans would be significantly more persistent.

PCP is generally considered to be mobile in the soil environment, but its mobility is highly dependent on pH, being least mobile under conditions of high pH and organic content. The soil pH values at SWMU 29 are expected to fall into the 5 to 8 range. PCP is moderately persistent in soil, with a reported field half-life of 45 days (Extoxnet, 2011). PCP sorption is expected to increase in soils with higher proportions of soil organic matter decreasing its mobility. PCP degradation is considered to occur primarily by anaerobic biodegradation in flooded or anaerobic (airless) soils, at higher temperatures, and in the presence of organic matter in the soil.

The RFI sampling was limited to soil. Groundwater was not addressed in this RFI. The RFI surface soil sampling results indicate that detections of SVOCs and PAHs in surface soil were widespread throughout the site. However, there were no detections of PCP in surface soil or subsurface soil. The majority of the

maximum SVOCs results were located directly beneath the assumed location of the former PCP Dip Tank. Detections of SVOCs and PAHs in subsurface soil were also primarily beneath or surrounding the location of the former PCP Dip Tank and at one location west of the Tank.

The general area of contamination at the site appears to be primarily beneath the location of the former PCP Tank. The soil sampling locations downgradient and west have lower concentrations of site-related chemicals of concern (COCs) than sampling locations within the area of the former PCP Dip Tank. Although, some residual contamination (PAHs) may be due to operations of the PCP Dip Tank, no PCP was detected in any of the soil samples collected and analyzed. The SVOC contamination is most likely associated with the construction fill material, which contained asphalt, used at SWMU 29. Groundwater was not sampled because PCP was not detected in the subsurface soils.

RISK ASSESSMENTS

A baseline HHRA and a screening-level ERA were conducted. The findings are described in the text below.

BASELINE HUMAN HEALTH RISK ASSESSMENT

A baseline HHRA was performed to characterize the potential risks to likely human receptors under current and potential future land use. Potential receptors under current land use are industrial workers, construction works, and trespassers. Potential receptors under future land use are child and adult recreational users, and hypothetical child and adult residents.

The following chemicals were detected at maximum concentrations exceeding screening-levels and were retained as chemicals of potential concern (COPC):

- Surface Soil – benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene.

- Subsurface Soil – benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

No noncarcinogenic toxicity criteria were available for the identified COPCs: therefore, noncarcinogenic risks could not be estimated.

Incremental lifetime cancer risks (ILCRs) for all receptors exposed to surface soil and subsurface soil at SWMU 29 under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

ECOLOGICAL RISK ASSESSMENT

The screening-level ERA evaluated the potential for adverse ecological impacts due to site-related soil contamination. Bioaccumulation of contaminants into various biological media (e.g., plants, invertebrates, small mammals) depends on characteristics of the media such as pH, organic carbon, etc. Therefore, actual BAFs at the sites may be different than those used in the ERA and obtained from the literature. In particular, wildlife that typically roam over multiple sample locations are unlikely to obtain all of their food from within the most contaminated areas at SWMU 29. Based on the initial screening of the chemical data, several chemicals were initially selected as COPCs in surface soil because they did not have screening-levels. These chemicals were then further evaluated to refine the list of COPCs, and to better characterize risks to ecological receptors. In summary:

- No chemicals were retained as COPCs for potential risks to terrestrial plants and soil invertebrates.
- No chemicals were retained as COPCs for mammals and birds.

SUMMARY AND RECOMMENDATIONS

Table ES-1 presents a summary of receptor-specific human health risks and hazards, ecological risks, and recommendations for future actions for SWMU 29.

The purpose of the RFI phase of this project was to identify possible contaminant releases to soil that may require further investigation or pose a threat to human health and the environment.

All soil analytical data obtained during this RFI for SWMU 29 are considered to be valid for their intended purpose. It is believed that all reported data are adequately representative of site conditions and targeted soil populations. Results of the HHRA indicate that ILCRs for all receptors exposed to surface soil and subsurface soil at SWMU 29, under the RME and CTE scenarios, were less than or within USEPA's and IDEM's target risk range of $1x10^{-6}$ to $1x10^{-4}$. The results of the screening ERA indicate that no chemicals were retained as COPCs for potential risks to terrestrial plants, soil invertebrates, mammals, or birds.

The results of the human health and ecological risk assessments indicate that SWMU 29 does not require further investigation and does not pose an unacceptable risk to human health and the environment.

Therefore, it is recommended that SWMU 29 be designated as a no further action (NFA) site and eliminated from further consideration.

TABLE ES-1

SUMMARY OF RECEPTOR-SPECIFIC HUMAN HEALTH RISKS AND HAZARDS, ECOLOGICAL RISKS, AND RECOMMENDATIONS
SWMU 29 - RFI REPORT
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Medium	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways and Chemicals of Concern	Recommendations
Construction Workers (future land use)	Surface Soil	7E-08	NA[(1)]	NA	NA	NFA
Industrial Workers (current and future land use)	Surface Soil	1E-06	NA[(1)]	NA	NA	NFA
Adolescent Trespasser (current and future land use)	Surface Soil	2E-07	NA[(1)]	NA	NA	NFA
Small Child (0 to 6 years) Recreational User (future land use)	Surface Soil	1E-06	NA[(1)]	NA	NA	NFA
Adult Recreational User (future land use)	Surface Soil	3E-07	NA[(1)]	NA	NA	NFA
Lifelong Recreational User (future land use)	Surface Soil	2E-06	NA	NA	NA	NFA
On-base Residents (Children) (future land use)	Surface Soil	1E-05	NA[(1)]	NA	NA	NFA
On-base Residents (Adult) (future land use)	Surface Soil	2E-06	NA[(1)]	NA	NA	NFA
On-base Residents (Lifelong) (future land use)	Surface Soil	2E-05	NA	NA	NA	NFA
Construction Workers (future land use)	Subsurface Soil	1E-07	NA[(1)]	NA	NA	NFA
Industrial Workers (current and future land use)	Subsurface Soil	2E-06	NA[(1)]	NA	NA	NFA
Adolescent Trespasser (current and future land use)	Subsurface Soil	4E-07	NA[(1)]	NA	NA	NFA

TABLE ES-1

SUMMARY OF RECEPTOR-SPECIFIC HUMAN HEALTH RISKS AND HAZARDS, ECOLOGICAL RISKS, AND RECOMMENDATIONS
SWMU 29 - RFI REPORT
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Medium	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways and Chemicals of Concern	Recommendations
Small Child (0 to 6 years) Recreational User (future land use)	Subsurface Soil	2E-06	NA(1)	NA	NA	NFA
Adult Recreational User (future land use)	Subsurface Soil	4E-07	NA(1)	NA	NA	NFA
Lifelong Recreational User (future land use)	Subsurface Soil	3E-06	NA	NA	NA	NFA
On-base Residents (Children) (future land use)	Subsurface Soil	2E-05	NA(1)	NA	NA	NFA
On-base Residents (Adult) (future land use)	Subsurface Soil	3E-06	NA(1)	NA	NA	NFA
On-base Residents (Lifelong) (future land use)	Subsurface Soil	2E-05	NA	NA	NA	NFA
Terrestrial Plants and Invertebrates	Surface Soil			Acceptable		
Mammals and Birds	Surface Soil			Acceptable		

NA = Not applicable.
NFA = No further action.

COPC = Chemical of potential concern.

1 - There were no noncarcinogenic COPCs, therefore hazard indices were not calculated.

1.0 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) has prepared this Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for the Solid Waste Management Unit (SWMU) 29 (PCP Dip Tank), Naval Support Activity (NSA) Crane, located in Crane, Indiana, through the Naval Facilities Engineering Command Midwest (NAVFAC Midwest). This RFI was performed under Contract Task Order (CTO) F27N for the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62470-08-D-1001.

A pentachlorophenol (PCP) wood preservation chemical dip tank was located at SWMU 29 and operated between 1950 and 1965. NSA personnel reported that the dip tank leaked. However, there was no documentation available indicating the number of leaks, dates, or estimated quantities of PCP that may have leaked from the tank. The tank was removed in 1965. An Initial Assessment Study (IAS) conducted in 1983 inspected the dip tank location and revealed there is no vegetation stress or evidence to confirm the PCP leak (NEESA, 1983). The IAS found no evidence of a leak and recommended no further action (NFA). In 1987, a Preliminary Review/Site Inspection (A.T. Kearney, 1987) was conducted and recommended that soil should be sampled in the location of the former tank to verify the conclusions of the IAS Study. There are no groundwater monitoring wells at this SWMU.

1.1 PURPOSE

The purpose of this RFI Report is to describe the site investigation activities conducted at SWMU 29 and to present the results and interpretation for the investigation. This report provides information regarding concentrations of site-specific semi-volatile organics (SVOCs), polynuclear aromatic hydrocarbons (PAHs), PCP, PCP-related compounds, and PCP degradation byproducts in surface soils and subsurface soils at SWMU 29. In addition, human health and ecological risks associated with SWMU 29 were evaluated by way of a baseline human health risk assessment (HHRA) and a screening-level ecological risk assessment (ERA). The risk assessments were performed using the data collected during the field investigation conducted in July 2011.

1.2 SITE BACKGROUND

1.2.1 Site Location and Description

NSA Crane is located in a rural, sparsely populated region of south-central Indiana, approximately 75 miles southwest of Indianapolis, 60 miles northwest of Louisville, Kentucky, and immediately east of

Burns City and Crane Village, Indiana. A site location map of the NSA Crane facility is provided as Figure 1-1. NSA Crane encompasses approximately 62,463 acres, or approximately 98 square miles, of the northern portion of Martin County and smaller portions of Greene, Daviess, and Lawrence Counties.

SWMU 29 is contained within the boundary of NSA Crane and is located just south of Lake Greenwood in the northwest portion of the base. Drainage from SWMU 29 flows into an unnamed creek that drains into Lake Greenwood, which is 800 feet northwest of SWMU 29 (see Figure 1-2). The location of SWMU 29 within the drainage basins of NSA Crane is shown on Figure 1-2.

1.2.2 Site History

The SWMU 29 PCP Dip Tank was located approximately 75 feet northwest of Building 56 at NSA Crane. As discussed, the SWMU 29 Dip Tank was in operation between 1950 and 1965 and NSA personnel reported that the dip tank leaked, but no information is available documenting the releases. The dip tank was removed in 1965. SWMU 29 includes the location of the former PCP Dip Tank as well as the surrounding area (see Figure 1-3).

1.3 PREVIOUS INVESTIGATIONS

The ISA of the PCP Dip Tank was conducted in 1983 (NEESA, 1983). The purpose of the ISA was to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous materials operations. The former PCP Dip Tank location was evaluated with regard to contamination characteristics, migration pathways, and pollutant receptors. The ISA inspection revealed that there was no vegetation stress, soil staining, or other evidence indicating a potential PCP leak and recommended no further action.

In 1987 (A.T. Kearney, 1983), a Preliminary Review/Visual Site Inspection was conducted at SWMU 29 to identify and evaluate the potential for releases to the environment of PCP and the need for further actions. The results of the Preliminary Review/Inspection Report recommended that soil should be sampled in the location of the former tank to verify the conclusions of the ISA Study.

1.4 REPORT ORGANIZATION

This report was prepared in the following format, standard for an RFI Report.

- Section 1.0 of the report is the introduction, including the purpose, site background, site description, site history, previous investigations, and report organization.

- Section 2.0 describes the study area field sampling activities and procedures associated with the data collection.

- Section 3.0 discusses data presentation and data quality review.

- Section 4.0 describes the physical characteristics of SWMU 29.

- Section 5.0 presents an evaluation of the nature and extent of contamination detected at SWMU 29 in this field investigation.

- Section 6.0 presents a discussion on the fate and transport of the contaminants and the conceptual site model.

- Section 7.0 identifies the chemicals of concern (COCs) and presents the results of the HHRA.

- Section 8.0 presents the results of the screening level ERA.

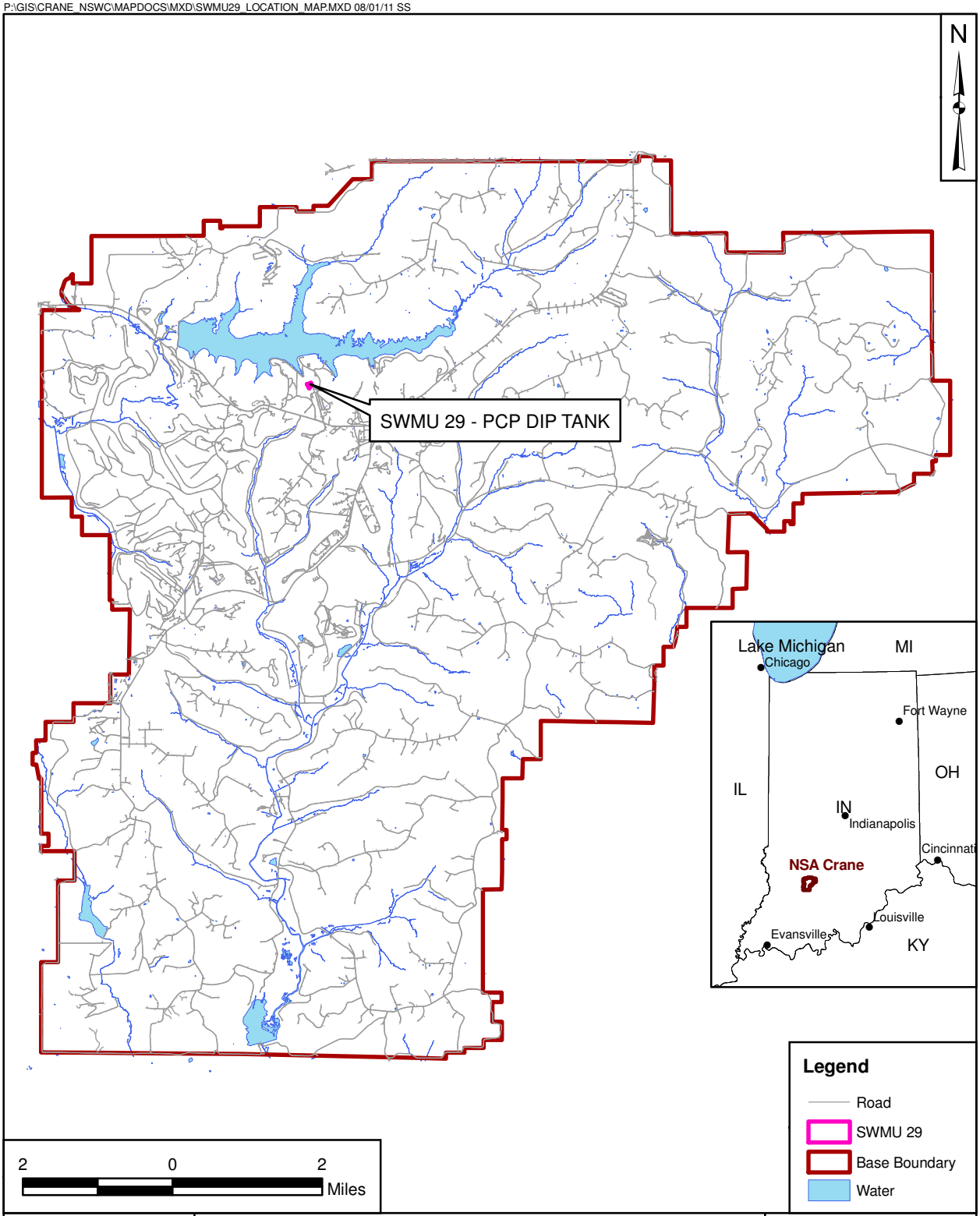
- Section 9.0 presents conclusions and recommendations.

The information included in each appendix of the RFI Report is summarized below:

- Appendix A – Photographs
- Appendix B – Field Forms
  - B.1 – Boring and Soil Log Sheets
  - B.2 – Field Notes
  - B.3 – Calibration Logs
  - B.4 – Chain of Custody
- Appendix C - Analytical Data
  - C.1 – SWMU 29 Analytical Data Surface Soil
  - C.2 – SWMU 29 Analtyical Data Subsurface Soil

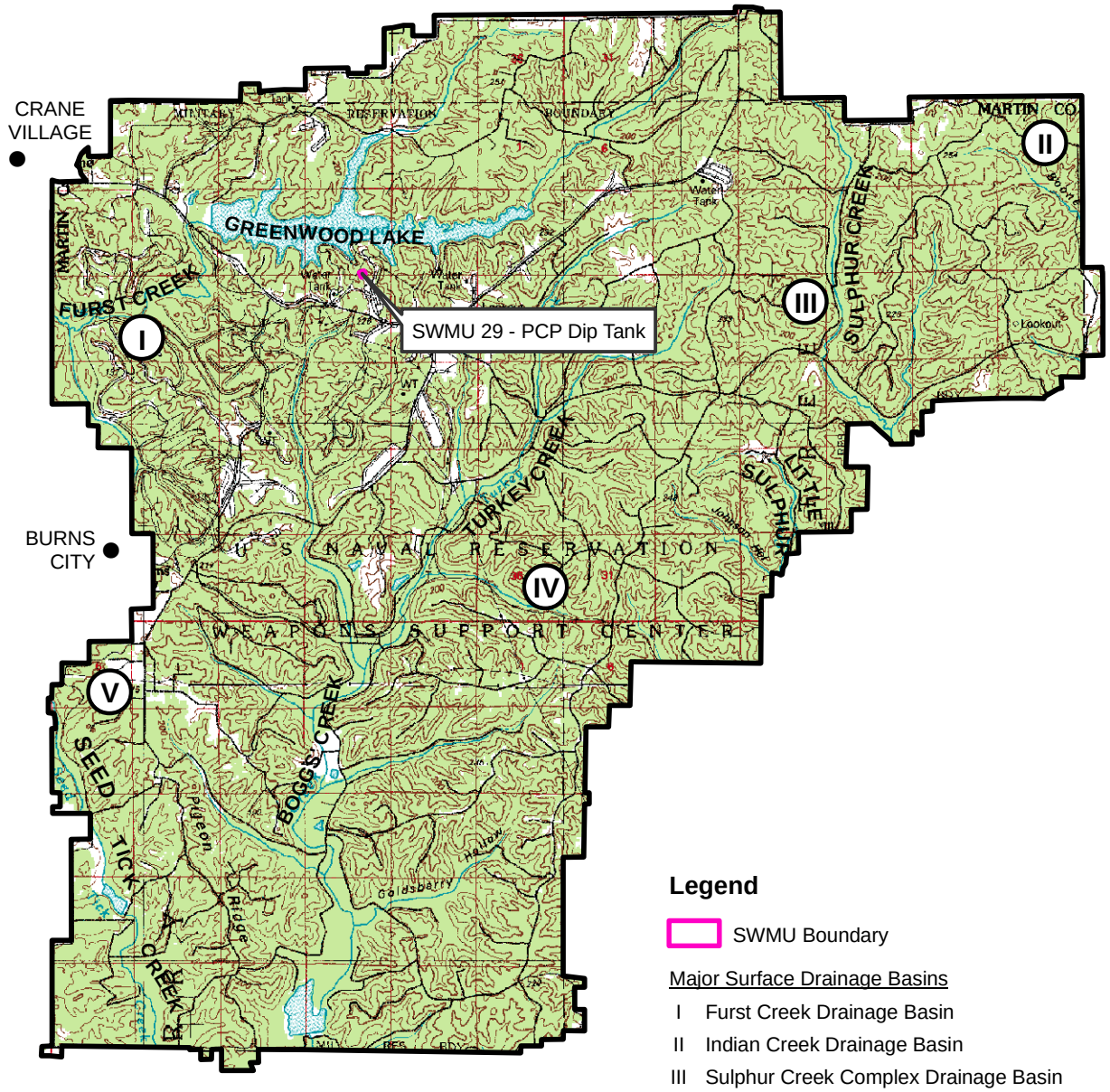
- Appendix D – Data Quality Review
- Appendix E – Supporting Documentation for the Human Health Risk Assessment
- Appendix F – Supporting Documentation for the Ecological Risk Assessment

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU29_LOCATION_MAP.MXD 08/01/11 SS



DRAWN BY S. STROZ	DATE 11/09/10	TETRA TECH	CONTRACT NUMBER CTO F27N
CHECKED BY J. LUCAS	DATE 11/19/10	BASE AND SITE LOCATION MAP SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	APPROVED BY ___ DATE ___
REVISED BY	DATE		APPROVED BY ___ DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 1-1 REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU29_DRAINAGE.MXD 08/04/11 JEE



Legend

SWMU Boundary

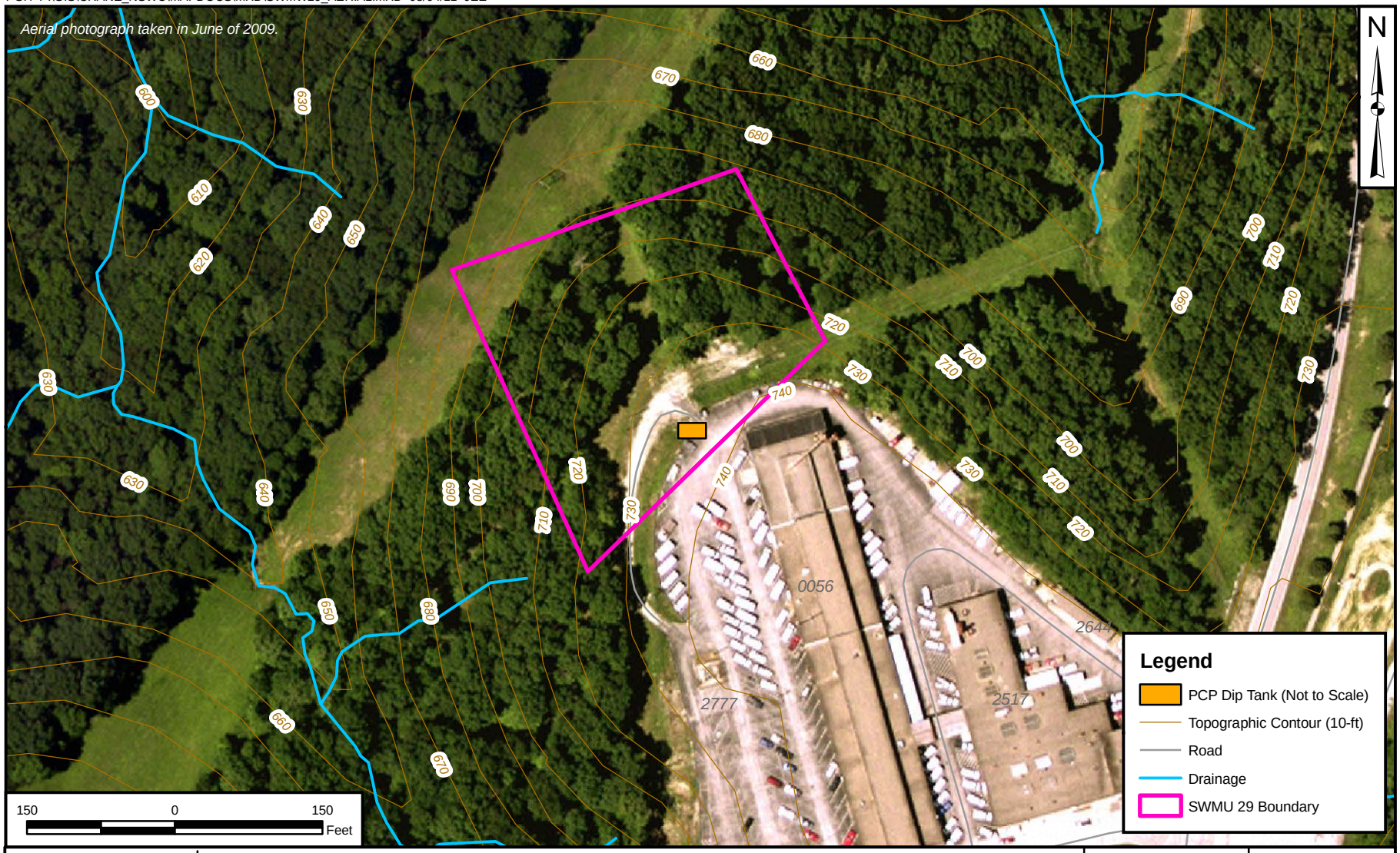
Major Surface Drainage Basins

I Furst Creek Drainage Basin
II Indian Creek Drainage Basin
III Sulphur Creek Complex Drainage Basin
IV Boggs & Turkey Creek Drainage Basin
V Seed Tick Creek Drainage Basin

Source: "Initial Assessment of Study of Naval Weapons Support Center Crane, Indiana." Naval Energy and Environmental Support Activity, May 1983.

DRAWN BY: S. STROZ	DATE: 08/01/11	TETRA TECH		CONTRACT NUMBER: 3137	CTO NUMBER: F27N
CHECKED BY: E. BERKLITE	DATE: 08/01/11	SWMU 29 LOCATION AND SURFACE DRAINAGE BASINS NSA CRANE CRANE, INDIANA		APPROVED BY: ___	DATE: ___
REVISED BY: ___	DATE: ___			APPROVED BY: ___	DATE: ___
SCALE: AS NOTED				FIGURE NO.: FIGURE 1-2	REV: 0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMW29_AERIAL.MXD 08/04/11 JEE



DRAWN BY: S. STROZ	DATE: 12/06/10	TETRA TECH	CONTRACT NUMBER: 3137 / CTO NUMBER: F27N
CHECKED BY: E. BERKLITE	DATE: 08/04/11	SWMU 29 - PCP DIP TANK FEATURES NSA CRANE CRANE, INDIANA	APPROVED BY: — / DATE: —
REVISED BY: J. ENGLISH	DATE: 08/04/11		APPROVED BY: — / DATE: —
SCALE: AS NOTED			FIGURE NO.: FIGURE 1-3 / REV: 0

2.0 FIELD INVESTIGATION

This section presents sampling activities, procedures, and documentation utilized during field operations performed July 13, 2011, at NSA Crane SWMU 29.

2.1 OVERVIEW

RFI field activities were conducted July 13, 2011. All work performed was conducted in accordance with the procedures and methodologies described in the United States Environmental Protection Agency (USEPA)approved Uniform Federal Policy for Sampling and Analysis Plan (UFP-SAP) (Tetra Tech, 2011). Standard Operating Procedures (SOPs) that governed the field work are included in Appendix D of the approved UFP-SAP (Tetra Tech, 2011).

Photographs are provided in Appendix A. Sample locations of SWMU 29, copies of all field forms, records, field logbooks, and health and safety documentation associated with the field investigation are provided in Appendix B of this document.

2.2 MOBILIZATION/DEMOBILIZATION

Following approval of the UFP-SAP (Tetra Tech, 2011), Tetra Tech began mobilization activities. All field team members reviewed the approved UFP-SAP, associated appendices, and the Health and Safety Plan (HASP) prior to the start of project activities. In addition, the Field Operations Leader (FOL) held field team orientation meetings prior to the start of field activities to ensure that personnel were familiar with the scope of the field activities.

Prior to the initiation of fieldwork, the FOL arrived at the site and began on-site mobilization activities. These activities included coordination with base personnel and utility clearance of all proposed boring locations through the NSA Crane Public Works Office. The equipment required for the field activities was shipped to the site. The Project Manager (PM) was onsite to observe and help coordinate sampling activities. At the conclusion of the field activities, the FOL oversaw the decontamination and demobilization of all equipment.

2.3 SUBSURFACE INVESTIGATION METHODOLOGIES AND PROCEDURES

2.3.1 Drilling

All borings were installed in accordance with SOP-05 (Tetra Tech, 2011) and logged in accordance with SOP-07 (Tetra Tech, 2011). Boring logs can be found in Appendix B.1. Drilling methods used during each round, along with boring date, boring depth, and depth intervals for soil sampling are presented in Table 2-1.

Eleven borings for soil sampling were drilled using direct-push technology (DPT) methods (see Table 2-1).

The DPT method involves pushing sampling tools hydraulically and/or mechanically downward into the ground to the desired depth. Soil samples were collected from borings for chemical analyses and for lithologic logging. All samples obtained from the boreholes were screened with a photoionization detector (PID) immediately upon opening. All PID readings were recorded on the boring logs. Soil sample collection information is provided in Section 2.4.1.

Figure 2-1 shows the locations of all soil borings completed as part of the RFI at SWMU 29. The exposure unit for this study is the area where the former PCP Dip Tank was located just northwest of Building 0056. This exposure unit is illustrated on Figure 2-1. This exposure unit has an area of approximately 0.05 acres and is comprised of the location of the former PCP Dip Tank, a perimeter zone (1,950 sq ft) where staging of Dip Baskets may have occurred, and an extended area (630 sq ft) on the west side of the tank where spilled solution may have flowed downslope from the tank. The location and size of this area were selected on the basis of information from aerial photos and original design drawings and the project team is willing to accept the overestimates of risk for this initial phase of investigation. DPT soil borings were advanced to refusal (bedrock), which was less than 10 feet below ground surface (bgs) at all boring locations. The sample depths for SWMU 29 soil samples are listed in Table 2-1.

2.3.2 Borehole and Sample Logging

A Tetra Tech geologist maintained a log for each boring in accordance with SOP-07 (Tetra Tech, 2011). The boring logs for each round can be found in Appendix B.1, and at a minimum, contain the following information:

- Boring identification
- Name of geologist logging the boring
- Name of drilling contractor

- Sample number and type
- Sample depth
- Sample recovery and sample interval
- Soil density or cohesiveness
- Soil color
- Unified Soil Classification System (USCS) material descriptions
- Rock type and description, recovery, and rock quality designation (RQD)
- Location of boring
- Drilling problems or deviations from the project-specific approved Quality Assurance Project Plan (QAPP) or the Addendums No. 1 and No. 2 to the approved QAPP.
- Date(s) of drilling
- Screening instrument readings

In addition, depths of changes in lithology, sample moisture observations, PID readings, drilling methods, and total depth of each borehole were included on each log, as well as any other pertinent observations.

2.3.3 Borehole Abandonment

All DPT soil borings at SWMU 29 were backfilled with bentonite chips and hydrated in accordance with the manufacturer's specifications. The ground surface at all boring locations was restored to its original condition.

2.4 SAMPLING OPERATIONS

This section discusses the methodology for all soil sampling activities performed at SWMU 29. Table 2-2 provides a summary of all samples collected, as well as a list of the proposed analyses. Table 2-3 provides the reasoning why a proposed sample was not collected or why additional samples were collected at the borehole. If the borehole location for the sample collected was moved in a horizontal direction for safety reasons, it is discussed below in Section 2.5 (Deviations from the Work Plan).

2.4.1 Soil Sampling

During field activities for the RFI, 20 soil samples, plus two duplicate samples, were collected from 11 soil borings. Soil samples were collected via DPT in accordance with SOP-05 (Tetra Tech, 2011). Figure 2-1 presents the soil boring locations. Soil sample log sheets are included in Appendix B.1 of this document.

2.4.1.1 Surface Soil Sampling

Ten of the 11 proposed surface soil samples were collected. Five of the 10 samples were collected from 0 to 2 feet bgs and five of the samples were collected from 0 to 4 feet bgs. All surface soil samples consisted of fill material. The surface soil samples were collected utilizing DPT methods from the ground surface to depths ranging from 2 feet below ground surface (bgs) to as deep as 4 feet bgs, depending on the thickness of the fill material, which contained large-sized gravel and pieces of asphalt. The surface soil samples were collected beneath the gravel fill material zone from soil-like material. Upon retrieval, all samples were monitored for the presence of volatile organic compounds (VOCs) using a PID. The results of this screening were recorded on the boring logs and/or soil sample log sheets (Appendix B.1). No PID readings were observed above background. All soil samples were collected in 4-ounce jars following homogenization and placed on ice in a cooler for shipment. The surface soil samples were analyzed for diesel-range organics (DRO), PCP, and SVOCs. Soil samples collected for dioxin/furans were extracted at the fixed based laboratory (FBL) but were held for analysis pending PCP analytical results.

2.4.1.2 Subsurface Soil Sampling

Ten of the proposed 22 subsurface soil samples were collected at SWMU 29. Subsurface soil samples were collected at various depths between 2 to 6 feet bgs using DPT drilling

Upon retrieval, all subsurface samples were monitored for the presence of VOCs using a PID. The results of this screening were recorded on the boring logs and/or soil sample log sheets (found in Appendix B.1 of this document). No PID readings were observed above background. All soil samples were collected in 4-ounce jars following homogenization and placed on ice in a cooler for shipment. The subsurface soil samples were analyzed for DRO, PCP, and SVOCs. Soil samples collected for dioxin/furans were extracted at the FBL but were held for analysis pending PCP analytical results

2.5 DEVIATIONS FROM THE WORK PLAN (SWMU 29)

- Soil boring 29SB02 was moved approximately 6 feet south, due to an overhead power line.
- Soil boring 29SB08 was moved approximately 3 feet south, away from overhead power lines.
- Soil boring 29SB09 was moved approximately 7 feet southeast, due to nearby overhead power lines and an underground water line.
- Soil boring 29SB11 was moved 2 feet east, away from overhead power lines.

- All borings were drilled twice [boring locations for duplicate and matrix spike/matrix spike duplicate (MS/MSD) collection were drilled three times] due to low sample recovery. The borings were within 1 to 2 feet of each other. A large amount of fill material (pebbles, etc.) was present and little native soil was found above the bedrock.

- Three soil sample collection depths were proposed, one surface (0 to 2 feet) and two subsurface (2 to 6 feet and 6 to 10 feet) for a total depth of 10 feet bgs, at each soil boring location. At all of the 11 borings, bedrock was encountered prior to 10 feet bgs; therefore, the total samples collected were reduced. One surface and one subsurface soil sample was collected at all soil boring locations, except at 29SB004, where only the surface soil sample was collected and at 29SB003, where only the subsurface soil was collected.

- The original proposed depths for the surface and subsurface soil samples, collected at each of the soil boring locations, was altered. The surface soil sample total depth varied from 0 to 2 feet to 0 to 4 feet bgs, depending on the amount of fill material encountered. The subsurface soil sample collected was the depth just beneath the fill material to bedrock refusal. The deepest overburden soil material encountered prior to bedrock refusal was at a depth of 6.5 feet bgs at 29SB006.

2.6 FIELD SAMPLE DOCUMENTATION

Sample documentation consisted of the completion of boring logs, matrix-specific sample log sheets, sample bottle tags, chain-of-custody records, field task modification request (FTMR) forms, equipment calibration log sheets, field logbooks, and health and safety documentation. Field documentation was completed as per SOP-03 (Tetra Tech, 2011). The sample log sheets contain information such as sample location and sample identification (ID), container requirements and analyses to be performed, sample type, time, date, and method of sample collection. Any unusual circumstances encountered during sample collection were noted on the form. Sample log sheets can be found in Appendix B.1 of this document. Equipment calibration log sheets are discussed in Section 2.10.1 and can be found in Appendix B.3 of this document. Chain-of-custody records (see Appendix B.4) were used to track each sample from collection to receipt and analysis at the laboratory. Upon completion of sample analyses, sample bottle tags were forwarded by laboratory personnel to the NSA Crane Environmental Protection Department (EPD) for storage.

2.7 SAMPLE HANDLING, PACKAGING, AND SHIPPING

Sample handling activities included field-related considerations concerning the selection of sample containers, preservatives, allowable holding times, sample custody, and maintaining samples at the appropriate storage temperature. Sampling containers were sealed in Ziploc® plastic bags, and glass containers were wrapped in plastic bubble wrap to minimize the possibility of breakage during transport. The sample containers were then placed in a cooler lined with a large plastic garbage bag. The cooler was packed with a cushioning material (bubble wrap) to prevent container breakage. Samples were cooled immediately after collection with ice placed over the sample containers. A temperature blank was placed in each cooler prior to shipment. The plastic garbage bag was sealed with a knot, and the chain-of-custody form was sealed in a Ziploc® bag and taped to the inside of the cooler lid. A signed and dated custody seal was applied to each end of the cooler and then covered with strapping tape to provide a tamper-evident seal. A Federal Express® airbill was applied to the shipping cooler. Tetra Tech maintained custody of the samples until they were relinquished to Federal Express®. The Federal Express® tracking number (airbill number) was recorded on the chain-of-custody form, and the sender's copy of the airbill was maintained for shipment tracking, if needed. All samples were shipped to the laboratories for overnight delivery and were received within sample holding times. Sample bottle tags were removed from each sample bottle by laboratory personnel and forwarded to the NSA EPD.

2.8 QUALITY CONTROL SAMPLES

Quality assurance/quality control (QA/QC) samples were collected and generated during sampling activities to monitor both field and laboratory procedures. These procedures are detailed in the approved UFP-SAP. QA/QC samples included field duplicates, equipment rinsate blanks, trip blanks, source water blanks, and temperature blanks. Field duplicate tabulated results are presented in Appendix C (Analytical Database) of this document. These types of QA/QC samples are briefly described below:

- Field Duplicates - Field duplicates consisted of two samples collected independently at a sampling location. The boring locations for the duplicate samples were drilled three times due to low sample recovery. Field duplicates were collected to assess the overall precision of the sampling and analysis program.

- Temperature blanks - Temperature blanks were used to determine if samples were adequately cooled during shipment. Temperature blanks consisted of analyte-free water poured into a clean sample container at the site or supplied by the fixed-based laboratory. One temperature blank was submitted to the laboratory in each cooler, and the temperature was checked upon receipt at the laboratory.

2.9 FIELD INSTRUMENT MEASUREMENTS

Field measurements included ambient air measurements monitoring of organic vapors in the breathing zone during intrusive field investigation activities and monitoring of organic vapors emanating from site sources such as soil samples. A PID was used for this purpose.

2.9.1 Equipment Calibration

Instruments used in the field were calibrated daily prior to use according to the manufacturers' requirements and in accordance with applicable SOPs. Equipment calibration logs can be found in Appendix B.3.

2.9.2 Field Investigation Preventive Maintenance Procedures/Schedule

The field instruments for this project included the PID. The specific preventive maintenance procedures followed for field equipment were those recommended by the equipment manufacturers.

A maintenance check was conducted on the PID before the start of sampling. The check indicated no anomalies or other indications that the PID needed maintenance and was therefore used during sample collection.

2.10 DECONTAMINATION

The nondedicated, nondisposable equipment involved in field sampling activities was decontaminated before beginning work, during drilling and sampling activities, and at the completion of the RFI activities in accordance with SOP-04. This equipment included drilling rigs, down-hole tools, augers, and soil sampling equipment.

2.10.1 Major Equipment

All down-hole equipment, including down-hole drilling tools, were steam cleaned with high-pressure hot water prior to beginning work, between borings, and at the conclusion of each shift of drilling.

2.10.2 Sampling Equipment

All nondedicated (reusable) equipment used for collecting samples was decontaminated both before field sampling, between sample collections, and at the end of each sampling event. This equipment included stainless-steel trowels, stainless-steel mixing bowls, etc. The following decontamination steps were taken:

- Potable water and phosphate-free detergent wash (scrub if necessary)
- Potable water rinse
- Deionized (DI) water rinse
- Air dry (if possible)
- Wrap in aluminum foil (if not to be used immediately)

An isopropanol rinse was not necessary because no oily residue was evident on the sampling equipment.

2.11 FIELD CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or "out of quality control" performance that can affect data quality, or modifying procedures to address unexpected/unusual field conditions encountered. The PM was responsible for assessing the suspected problems in consultation with the FOL and the field geologist.

Corrective action for the SWMU 29 soil sampling program included the following conditions:

- Relocation of four proposed sampling locations due to presence of overhead power lines.
- Collected surface soil samples to 4 feet bgs due to the present of fill material and little native soil
- Collected fewer subsurface samples due to bedrock being encountered prior to 10 feet bgs.

No nonconformances or suspected deficiencies occurred during the field investigation; however, deviations from the approved UFP-SAP occurred and are addressed in Section 2.5.

2.12 INVESTIGATION-DERIVED WASTE HANDLING

The field investigations generated several types of potentially contaminated waste including investigation-derived waste (IDW), personal protective equipment (PPE), decontamination fluids from the drill rig,

sampling equipment decontamination fluids, DPT macrocore plastic sleeves, development and purge water, and soil cuttings. Management of each residue was performed as follows:

PPE and DPT Macrocore Plastic Sleeves – All PPE, and macrocore plastic sleeves were decontaminated, double bagged, and placed in NSA Crane trash receptacles (i.e., dumpsters).

Drill and Sampling Equipment Decontamination Fluids – All well development and purge waters and equipment decontamination fluids were collected and discharged to the NSA Crane permitted waste treatment plant.

Waste Cuttings, Cores, and Rock from Drilling Activities – For each boring, the cuttings produced were scanned for VOCs with a PID. VOC readings were at background levels for all borings; therefore, cuttings were used as backfill since all borings terminated above the water table. Any remaining cuttings were spread on the ground in the immediate vicinity of the boring.

Additional requirements for IDW handling can be found in the specific IDW SOP 6 contained in the Appendix D of the SWMU 29 UFP-SAP (Tetra Tech, 2011).

2.13 SITE MANAGEMENT AND FACILITY SUPPORT

The FOL was designated as the lead in coordinating all day-to-day activities during the investigation. The FOL was responsible for ensuring that all field team members (including subcontractors) were familiar with the approved UFP-SAP and the HASP. Additionally, the FOL was responsible for all sampling operations, QA/QC, field documentation requirements, and field change orders. The FOL reported to the TOM on a daily basis regarding the status of fieldwork.

All site preparation, mobilization/demobilization, and sampling activities were coordinated through NSA Crane personnel.

2.14 RECORDKEEPING

Various hardcover, bound record books were maintained for each field activity in accordance with SOP-03 (Tetra Tech, 2011). The Master Site Logbook served as the overall record of field activities. Information recorded daily in the Master Site Logbook included daily field activities, weather conditions, identity of and arrival and departure times of personnel, management issues, etc. Copies of field log books are included in Appendix B.2.

The FOL was responsible for the maintenance and security of all field records. Eventually, all field records, chain-of-custody forms, sample log sheets, field forms, logbooks, and notebooks were docketed and incorporated in the central project file.

TABLE 2-1

BORING DATES AND DEPTHS
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Boring Number	Total Depth (feet bgs)	Drilling Method	Date Drilled	Depth Interval(s) of Soil Samples (feet bgs)
29SB001	3	DPT	13-Jul-11	0-2, 2-3
29SB002	6	DPT	13-Jul-11	0-4, 4-6
29SB003	5.6	DPT	13-Jul-11	4-6
29SB004	3.5	DPT	13-Jul-11	0-4
29SB005	5.8	DPT	13-Jul-11	0-4, 4-6
29SB006	6.5	DPT	13-Jul-11	0-2, 2-7
29SB007	3.3	DPT	13-Jul-11	0-2, 2-4
29SB008	5.5	DPT	13-Jul-11	0-4, 4-6
29SB009	5.7	DPT	13-Jul-11	0-4, 4-6
29SB010	4	DPT	13-Jul-11	0-3, 3-4
29SB011	2.7	DPT	13-Jul-11	0-2, 2-3

Notes:
DPT = Direct Push Technology
bgs = below ground surface

TABLE 2-2

SAMPLING SUMMARY
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Sample Name	Depth (feet bgs)	SVOC AND SIM PAHS	PCP AND RELATED COMPOUND	DRO	DIOXINS/ FURANS*	**Field Parameters
SURFACE						
29SS001-0002	0 to 2.0	X	X	X	X	PID
29SS002-0004	0 to 4.0	X	X	X	X	PID
29SS004-0004	0 to 4.0	X	X	X	X	PID
29SS005-0004	0 to 4.0	X	X	X	X	PID
29SS006-0002	0 to 2.0	X	X	X	X	PID
29SS007-0002	0 to 2.0	X	X	X	X	PID
29SS008-0004	0 to 4.0	X	X	X	X	PID
29SS009-0004	0 to 4.0	X	X	X	X	PID
29SS010-0002	0 to 2.0	X	X	X	X	PID
29SS011-0002	0 to 2.0	X	X	X	X	PID
SUBSURFACE						
29SB001-0203	2.0 to 3.0	X	X	X	X	PID
29SB002-0406	4.0 to 6.0	X	X	X	X	PID
29SB003-0406	4.0 to 6.0	X	X	X	X	PID
29SB005-0406	4.0 to 6.0	X	X	X	X	PID
29SB006-0206	2.0 to 6.0	X	X	X	X	PID
29SB007-0204	2.0 to 4.0	X	X	X	X	PID
29SB008-0406	4.0 to 6.0	X	X	X	X	PID
29SB009-0406	4.0 to 6.0	X	X	X	X	PID
29SB010-0204	2.0 to 4.0	X	X	X	X	PID
29SB011-0203	2.0 to 3.0	X	X	X	X	PID
29FD071311-01 (25SB010-0003)	0 to 2.0	X	X	X	X	PID
29FD071311-02 (25SB006-0206)	2.0 to 6.0	X	X	X	X	PID

Notes:
bgs - below ground surface
DRO - Diesel Range Organics
SIM PAHS - Selected Ion Monitoring Polycyclic Aromatic Hydrocarbons
SVOCs - Semi-volatile Organic Carbons
PID - Photoionization detector
*Contingent upon initial PCP analyses.
**All PID readings were below background.

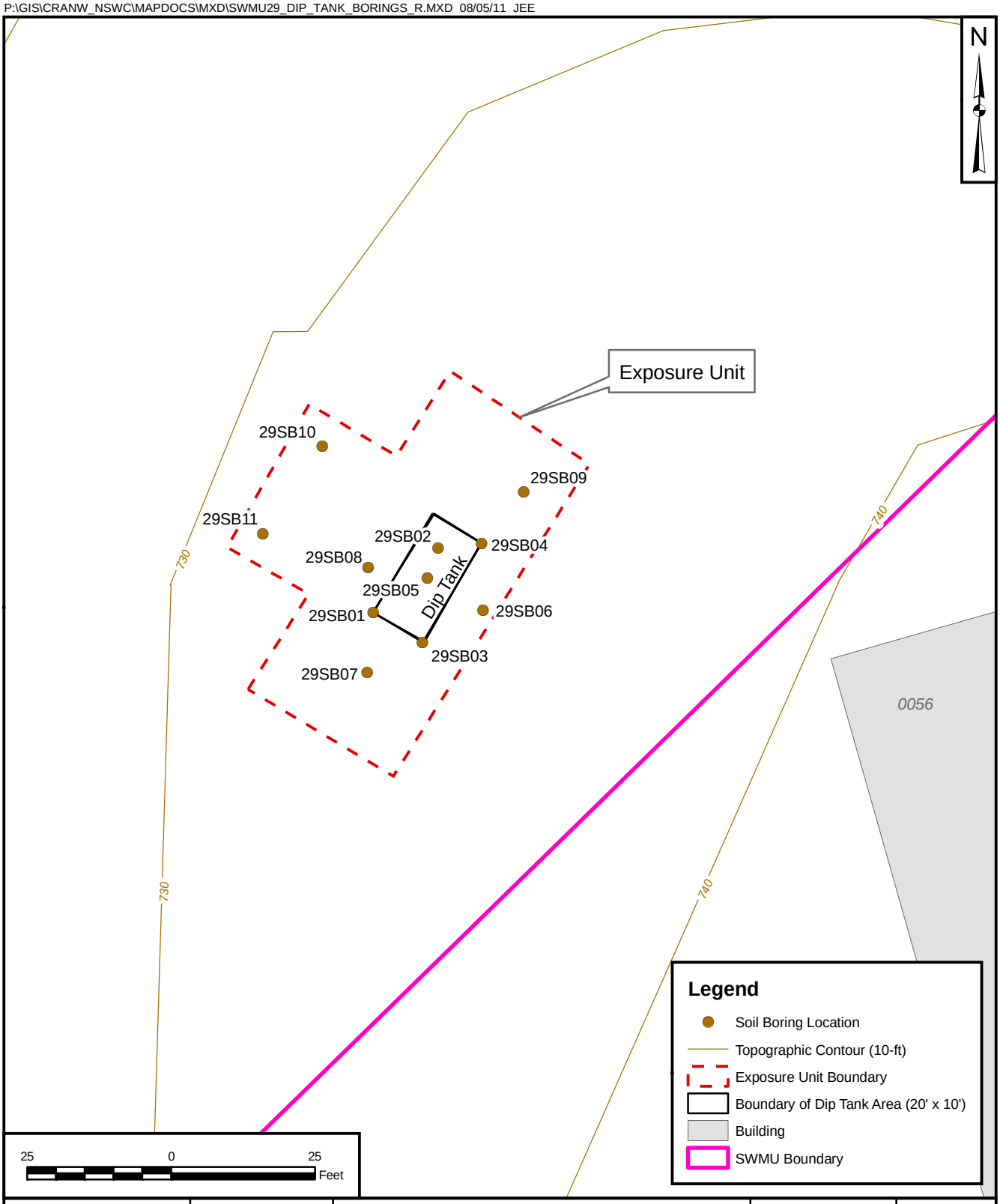
TABLE 2-3

SAMPLE DEVIATION
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Proposed Soil Sample	Reason for not collecting/altering
29SB0010206	Soil sample collected at a depth of 2-3 feet bgs due to boring refusal at 3 feet bgs.
29SB0010610	Boring Refusal
29SS0020002	Gravel fill material with insufficient soil for sample collection from 0-2.5 feet bgs.
29SB0020206	Soil sample collected at a depth of 4-6 feet bgs from bottom of fill material at 4 feet bgs to boring refusal at 6 feet bgs.
29SB0020610	Boring Refusal
29SS0030002	Gravel fill material with insufficient soil for sample collection from 0-3 feet bgs.
29SB0030206	Soil sample collected at a depth of 4-6 feet bgs from bottom of fill material at 4 feet bgs to boring refusal at 6 feet bgs.
29SB0030610	Boring Refusal
29SS0040002	Gravel fill material with insufficient soil for sample collection from 0-3.5 feet bgs.
29SB0040206	Gravel fill material was present until 4 feet bgs and boring refusal was at 4 feet bgs.
29SB0040610	Boring Refusal
29SS0050002	Gravel fill material with insufficient soil for sample collection from 0-3.5 feet bgs.
29SB0050206	Soil sample collected at a depth of 4-6 feet bgs from bottom of fill material at 4 feet bgs to boring refusal at 6 feet bgs.
29SB0050610	Boring Refusal
29SB0060610	Boring Refusal
29SB0070206	Soil sample collected at a depth of 2-4 feet bgs due to boring refusal at 4 feet bgs.
29SB0070610	Boring Refusal
29SS0080002	Gravel fill material with insufficient soil for sample collection from 0-3 feet bgs.
29SB0080206	Soil sample collected at a depth of 4-6 feet bgs from bottom of fill material at 4 feet bgs to boring refusal at 6 feet bgs.
29SB0080610	Boring Refusal
29SS0090002	Gravel fill material with insufficient soil for sample collection from 0-3 feet bgs.
29SB0090206	Soil sample collected at a depth of 4-6 feet bgs from bottom of fill material at 4 feet bgs to boring refusal at 6 feet bgs.
29SB0090610	Boring Refusal
29SB0100206	Soil sample collected at a depth of 2-4 feet bgs due to boring refusal at 4 feet bgs.
29SB0100610	Boring Refusal
29SB0110206	Soil sample collected at a depth of 2-3 feet bgs due to boring refusal at 3 feet bgs.
29SB0110610	Boring Refusal

bgs - below ground surface

P:\GIS\CRANW_NSWC\MAPDOCS\MXD\SWMU29_DIP_TANK_BORINGS_R.MXD 08/05/11 JEE



DRAWN BY: S. STROZ	DATE: 03/16/11	SOIL SAMPLING LOCATIONS SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	CONTRACT NUMBER: 3137 / CTO NUMBER: F27N
CHECKED BY: E. BERKLITE	DATE: 08/05/11		APPROVED BY: ___ / DATE: ___
REVISED BY: ___	DATE: ___		APPROVED BY: ___ / DATE: ___
SCALE: AS NOTED			FIGURE NO.: FIGURE 2-1 / REV: 0

3.0 DATA PRESENTATION AND QUALITY

This section describes the data and summarizes the data quality for the SWMU 29 field investigation performed July 13, 2011. Data presentation is provided in Section 3.1 and data quality is described in Section 3.2.

3.1 DATA PRESENTATION

RFI data were collected as described in Section 2.0. RTI Laboratories, Inc. (RTI) conducted the analyses, which are summarized for each sample in Table 2-2. Validation and quality review of the data were conducted by Tetra Tech as described in Section 3.2.

3.1.1 SWMU 29 Data Set Descriptions

3.1.1.1 SWMU 29 Surface Soil Site Data

In the July 2011 RFI investigation, select surface soil samples were collected to determine the potential presence of DRO, SVOCs, PAHs, and PCP and PCP-related compounds contamination in surface soil at SWMU 29 in the vicinity of the former PCP Dip Tank.

Some surface soil samples were not collected as scheduled. Explanations for why certain samples were not collected or were collected in addition to the scheduled samples are provided in Section 2.5 and Table 2-3. Appendix C-1 contains all the surface soil analytical data generated during the RFI investigation. The nature and extent of surface soil contamination is described in Section 5.0.

3.1.1.2 SWMU 29 Subsurface Soil Site Data

In the July 2011 RFI investigation, select subsurface soil samples were collected to determine the potential presence of DRO, SVOCs, PAHs, and PCP and PCP-related compounds contamination in subsurface soil at SWMU 29 in the vicinity of the former PCP Dip Tank.

Some subsurface soil samples were not collected as scheduled. Explanations for why certain samples were not collected or were collected in addition to the scheduled sample collections are provided in Section 2.0 and Table 2-3. Appendix C-2 contains all the subsurface soil analytical data generated during the RFI Investigation. The nature and extent of subsurface soil contamination is further described in Section 5.0.

3.2 DATA QUALITY

This section summarizes the data quality for the July 2011 RFI investigation data sets. A tabulation of data quality characteristics and a detailed QC data review for this investigation is presented in Appendix D of this report.

Based on the reviews in Appendix D, the following can be summarized about SWMU 29 data quality. Sample collection and analysis completeness was generally satisfactory with a few, insignificant exceptions (See Appendix D). The July 2011 RFI Investigation data were also generally of sufficient quality to support this RFI. Some analytes exhibited detection limits that exceeded the target levels. The exceedances are not considered to be excessive and are typical of environmental investigations. These exceedances should not affect the quality of the data and are of sufficient quality to support human health and ecological risk assessments.

The general data quality for the SWMU 29 field investigation is summarized below.

3.2.1 Laboratory Accuracy and Precision

Accuracy

Accuracy in the laboratory is measured through the comparison of a laboratory control sample (LCS) result to a known or calculated value and is expressed as a percent recovery (%R). Surrogates and internal standards assess accuracy in organic methods. LCSs assess the accuracy of laboratory operations with minimal sample matrix effects. Surrogate compound analyses measure the combined accuracy effects of the sample matrix, sample preparation, and sample measurement. Internal standards, added after preparation, are for sample quantitation. Laboratory accuracy is determined by comparing calculated %Rs to accuracy control limits specified by the laboratory using the appropriate analytical method.

Percent recovery is calculated using the following equation:

$$\%R = \frac{Ss - So}{S} \times 100$$

where %R = percent recovery
Ss = result of spiked sample

So = result of non-spiked sample

S = concentration of spiked amount.

Table 3-1 shows that the soil results were qualified because of hold time, blank contamination, LCS, surrogate, internal standard, or calibration noncompliances. The noncompliances in general do not show any directional bias trends within the data sets. Overall, the laboratory accuracy was acceptable and the amount of data qualified is not considered excessive. There were no QC deficiencies noted for field accuracy.

Precision

Precision is a measure of the degree to which two or more measurements are in agreement and describes the reproducibility of measurements of the same parameter for samples analyzed under similar conditions.

Precision for chemical parameters is expressed as a Relative Percent Difference (RPD), which is defined as the ratio of the difference to the mean for the two values being evaluated. RPDs, typically expressed as percentages, are used to evaluate both field and laboratory duplicate precision and are calculated as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where RPD = relative percent difference

V1, V2 = two results obtained by analyzing duplicate samples

The precision estimates obtained from duplicate field samples encompass the combined uncertainty associated with sample collection, homogenization, splitting, handling, laboratory and field storage (as applicable), preparation for analysis, and analysis. In contrast, precision estimates obtained from analyzing duplicate laboratory samples incorporate only homogenization, subsampling, preparation for analysis, laboratory storage (if applicable), and analysis uncertainties.

Laboratory or field duplicate imprecision did not result in any qualification of the soil data.

3.2.2 Representativeness

Representativeness is an expression of the degree to which data accurately and precisely depict the actual characteristics of a population or environmental condition existing at the site.

The UFP-SAP for SWMU 29 – PCP Dip Tank, Building 56 Area (Tetra Tech, 2011), and the use of standardized sampling, sample handling, sample analysis, and data reporting procedures were designed so that the final data would be accurate representations of actual site conditions. It is believed that all reported data are adequately representative of site conditions and intended populations.

3.2.3 Comparability

Comparability is defined as the confidence with which one data set can be compared with another (e.g., among sampling points and among sampling events). Comparability was achieved by using standardized sampling and analysis methods, as well as standardized data reporting formats. Comparability of laboratory measurements was achieved primarily through the use and documentation of standard sampling and analytical methods. Results were reported in units that ensured comparability with previous data. Comparability of laboratory measurements was assessed primarily through the use of QC samples and through adherence to the SAP for SWMU 29 – PCP Dip Tank, Building 56 Area (Tetra Tech, 2011).

3.2.4 Sensitivity

Analytical sensitivity was generally satisfactory to meet DQOs presented in the SAP for SWMU 29 – PCP Dip Tank, Building 56 Area (Tetra Tech, 2011). However, it was known at the start of the project that the laboratory could not meet the screening level limits for several analytes. The laboratory reported the nondetected results down to the limit of detection (LOD) in order to meet the screening level limits for as many analytes as possible.

Table 3-2 presents the range of nondetected values for analytes that did not meet the screening level limits for soils. The majority of LOD exceedances are within a factor of 2 to 4 of the targeted risk-based criterion except for nitrobenzene and 4-chloroaniline, which are not anticipated to be site-related contaminants. The range and number of exceedances are not considered excessive and should not have an impact on the quality of the data.

The following are reasons other than the laboratory LOD that can cause a nondetected result to exceed the screening level limits.

1. Laboratory or field blank contamination can cause the LOD to be raised to exceed screening level limits.

2. Percent moisture in soil samples can cause the adjusted LOD to exceed screening level limits.

3. Sample dilution due to concentrations greater than the calibration range of the instrument or due to matrix interference can raise the LOD to above screening level limits.

The risk assessment will determine the significance, if any, that the nondetected exceedances of the screening level limits have upon the data set.

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0010203	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance and Internal Standard Noncompliance
29SB0010203	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0010203	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0010203	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4-DINITROPHENOL	UG/KG	380	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0010203	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	4,6-DINITRO-2-METHYLPHENOL	UG/KG	96	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0010203	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	4-NITROPHENOL	UG/KG	380	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	ANTHRACENE	UG/KG	7.7	J	P	Uncertainty Near Detection Limit
29SB0010203	BENZO(G,H,I)PERYLENE	UG/KG	32	J	P	Uncertainty Near Detection Limit
29SB0010203	BENZO(K)FLUORANTHENE	UG/KG	24	J	P	Uncertainty Near Detection Limit
29SB0010203	DIBENZO(A,H)ANTHRACENE	UG/KG	13	J	H	Hold Time Exceedance
29SB0010203	DRO (C08-C28)	UG/KG	2200	U	A	Laboratory Blank Contamination
29SB0010203	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0010203	INDENO(1,2,3-CD)PYRENE	UG/KG	21	J	P	Uncertainty Near Detection Limit

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0010203	NAPHTHALENE	UG/KG	7.7	UJ	CH	Calibration and Hold Time Noncompliance
29SB0010203	PENTACHLOROPHENOL	UG/KG	96	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0010203	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0020406	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	2,4-DINITROPHENOL	UG/KG	390	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0020406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	98	UJ	C	Calibration Noncompliance
29SB0020406	BENZO(A)PYRENE	UG/KG	7.9	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0020406	DIBENZO(A,H)ANTHRACENE	UG/KG	7.9	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0020406	DRO (C08-C28)	UG/KG	1500	U	A	Laboratory Blank Contamination
29SB0020406	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	NAPHTHALENE	UG/KG	20	UJ	CH	Calibration and Hold Time Noncompliance
29SB0020406	PENTACHLOROPHENOL	UG/KG	98	UJ	CH	Calibration and Hold Time Noncompliance
29SB0030406	1,2,4,5-TETRACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0030406	1,2-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	1,3-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0030406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0030406	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0030406	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,4-DINITROPHENOL	UG/KG	380	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0030406	2,4-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,6-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-CHLORONAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-METHYLNAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	3-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	94	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0030406	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4-CHLOROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4-NITROPHENOL	UG/KG	380	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	ACENAPHTHENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	ACENAPHTHYLENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	ANTHRACENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0030406	BENZO(A)ANTHRACENE	UG/KG	26	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	BENZO(A)PYRENE	UG/KG	22	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	BENZO(B)FLUORANTHENE	UG/KG	28	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	BENZO(G,H,I)PERYLENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	BENZO(K)FLUORANTHENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	CARBAZOLE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	CHRYSENE	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	DIBENZO(A,H)ANTHRACENE	UG/KG	7.6	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0030406	DIBENZOFURAN	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	FLUORANTHENE	UG/KG	49	J	R	Surrogate Recovery Noncompliance
29SB0030406	FLUORENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	HEXACHLOROBENZENE	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0030406	INDENO(1,2,3-CD)PYRENE	UG/KG	38	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	N-NITROSODIPHENYLAMINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	NAPHTHALENE	UG/KG	7.6	UJ	CH	Calibration and Hold Time Noncompliance
29SB0030406	NITROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	PENTACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	PENTACHLOROPHENOL	UG/KG	94	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0030406	PHENANTHRENE	UG/KG	21	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0030406	PYRENE	UG/KG	32	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0050406	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4-DINITROPHENOL	UG/KG	380	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0050406	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2-METHYLNAPHTHALENE	UG/KG	8.7	J	P	Uncertainty Near Detection Limit
29SB0050406	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	95	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0050406	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	4-NITROPHENOL	UG/KG	380	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	CARBAZOLE	UG/KG	170	J	P	Uncertainty Near Detection Limit
29SB0050406	DIBENZOFURAN	UG/KG	84	J	P	Uncertainty Near Detection Limit
29SB0050406	DRO (C08-C28)	UG/KG	310000	J	R	Surrogate Recovery Noncompliance
29SB0050406	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	NAPHTHALENE	UG/KG	11	J	P	Uncertainty Near Detection Limit

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0050406	PENTACHLOROPHENOL	UG/KG	95	UJ	CH	Calibration and Hold Time Noncompliance
29SB0050406	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0060206	1,2,4-TRICHLOROBENZENE	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	1,4-DICHLOROBENZENE	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	2,4,6-TRICHLOROPHENOL	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	2,4-DINITROPHENOL	UG/KG	410	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0060206	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	C	Calibration Noncompliance
29SB0060206	BENZO(A)PYRENE	UG/KG	8.3	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0060206	DIBENZO(A,H)ANTHRACENE	UG/KG	8.3	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0060206	DRO (C08-C28)	UG/KG	3900	U	A	Laboratory Blank Contamination
29SB0060206	HEXACHLOROBENZENE	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	NAPHTHALENE	UG/KG	8.3	UJ	CH	Calibration and Hold Time Noncompliance
29SB0060206	PENTACHLOROPHENOL	UG/KG	100	UJ	CH	Calibration and Hold Time Noncompliance
29SB0060206-D	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	2,4-DINITROPHENOL	UG/KG	410	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0060206-D	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	C	Calibration Noncompliance
29SB0060206-D	BENZO(A)PYRENE	UG/KG	8.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0060206-D	DIBENZO(A,H)ANTHRACENE	UG/KG	8.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0060206-D	DRO (C08-C28)	UG/KG	3300	U	A	Laboratory Blank Contamination
29SB0060206-D	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	NAPHTHALENE	UG/KG	8.1	UJ	CH	Calibration and Hold Time Noncompliance
29SB0060206-D	PENTACHLOROPHENOL	UG/KG	100	UJ	CH	Calibration and Hold Time Noncompliance
29SB0070204	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	2,4-DINITROPHENOL	UG/KG	380	UJ	C	Calibration Noncompliance
29SB0070204	3-METHYLPHENOL	UG/KG	19	UJ	C	Calibration Noncompliance
29SB0070204	4,6-DINITRO-2-METHYLPHENOL	UG/KG	94	UJ	C	Calibration Noncompliance
29SB0070204	BENZO(A)PYRENE	UG/KG	8	UJ	H	Hold Time Exceedance
29SB0070204	DIBENZO(A,H)ANTHRACENE	UG/KG	8	UJ	H	Hold Time Exceedance
29SB0070204	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	NAPHTHALENE	UG/KG	8	UJ	H	Hold Time Exceedance
29SB0070204	PENTACHLOROPHENOL	UG/KG	94	UJ	H	Hold Time Exceedance
29SB0080406	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SB0080406	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SB0080406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0080406	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0080406	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0080406	2,4-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0080406	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	ACENAPHTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	ANTHRACENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	BENZO(A)ANTHRACENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	BENZO(A)PYRENE	UG/KG	7.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0080406	BENZO(B)FLUORANTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0080406	BENZO(G,H,I)PERYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	BENZO(K)FLUORANTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	CARBAZOLE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	CHRYSENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	DIBENZO(A,H)ANTHRACENE	UG/KG	7.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0080406	DIBENZOFURAN	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	FLUORANTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	FLUORENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SB0080406	INDENO(1,2,3-CD)PYRENE	UG/KG	35	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	NAPHTHALENE	UG/KG	7.1	UJ	H	Hold Time Exceedance
29SB0080406	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0080406	PHENANTHRENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PYRENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,2,4,5-TETRACHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,2,4-TRICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0090406	1,2-DICHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,3-DICHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,4-DICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0090406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0090406	2,4,5-TRICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,4,6-TRICHLOROPHENOL	UG/KG	40	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0090406	2,4-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,4-DIMETHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,4-DINITROPHENOL	UG/KG	400	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0090406	2,4-DINITROTOLUENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,6-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,6-DINITROTOLUENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-CHLORONAPHTHALENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-CHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-METHYLNAPHTHALENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-NITROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-NITROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	3-NITROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0090406	4-CHLORO-3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4-CHLOROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4-NITROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4-NITROPHENOL	UG/KG	400	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	ACENAPHTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	ACENAPHTHYLENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	ANTHRACENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0090406	BENZO(A)ANTHRACENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	BENZO(A)PYRENE	UG/KG	16	UJ	CH	Calibration and Hold Time Noncompliance
29SB0090406	BENZO(B)FLUORANTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	BENZO(G,H,I)PERYLENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	BENZO(K)FLUORANTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	CARBAZOLE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	CHRYSENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	DIBENZO(A,H)ANTHRACENE	UG/KG	16	UJ	CH	Calibration and Hold Time Noncompliance
29SB0090406	DIBENZOFURAN	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	FLUORANTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	FLUORENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	HEXACHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0090406	INDENO(1,2,3-CD)PYRENE	UG/KG	40	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	N-NITROSODIPHENYLAMINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	NAPHTHALENE	UG/KG	16	UJ	H	Hold Time Exceedance
29SB0090406	NITROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PENTACHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PENTACHLOROPHENOL	UG/KG	200	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0090406	PHENANTHRENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PYRENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0100204	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0100204	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0100204	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0100204	2,4-DINITROPHENOL	UG/KG	400	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0100204	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	C	Calibration Noncompliance
29SB0100204	BENZO(A)PYRENE	UG/KG	8.1	UJ	CH	Calibration and Hold Time Noncompliance
29SB0100204	DIBENZO(A,H)ANTHRACENE	UG/KG	8.1	UJ	CH	Calibration and Hold Time Noncompliance
29SB0100204	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0100204	NAPHTHALENE	UG/KG	8.1	UJ	H	Hold Time Exceedance
29SB0100204	PENTACHLOROPHENOL	UG/KG	100	UJ	CH	Calibration and Hold Time Noncompliance
29SB0110203	1,2,4-TRICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0110203	1,4-DICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0110203	2,3,4,6-TETRACHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2,4,6-TRICHLOROPHENOL	UG/KG	40	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0110203	2,4-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2,4-DIMETHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2,4-DINITROPHENOL	UG/KG	400	UJ	CER	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0110203	2,6-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2-CHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2-NITROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0110203	4-CHLORO-3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0110203	4-NITROPHENOL	UG/KG	400	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	CARBAZOLE	UG/KG	170	J	P	Uncertainty Near Detection Limit
29SB0110203	DIBENZOFURAN	UG/KG	38	J	P	Uncertainty Near Detection Limit
29SB0110203	DRO (C08-C28)	UG/KG	3400	U	A	Laboratory Blank Contamination
29SB0110203	HEXACHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0110203	NAPHTHALENE	UG/KG	16	UJ	H	Hold Time Exceedance
29SB0110203	PENTACHLOROPHENOL	UG/KG	200	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0110203	PHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0010002	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0010002	2,4-DINITROPHENOL	UG/KG	360	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0010002	2,4-DINITROTOLUENE	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0010002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	90	UJ	C	Calibration Noncompliance
29SS0010002	ANTHRACENE	UG/KG	9.7	J	P	Uncertainty Near Detection Limit
29SS0010002	CARBAZOLE	UG/KG	12	J	P	Uncertainty Near Detection Limit
29SS0010002	DRO (C08-C28)	UG/KG	4000	U	A	Laboratory Blank Contamination
29SS0020004	1,2,4-TRICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	1,4-DICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	2,4,5-TRICHLOROPHENOL	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0020004	2,4,6-TRICHLOROPHENOL	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	2,4-DINITROPHENOL	UG/KG	350	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0020004	2,4-DINITROTOLUENE	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0020004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	87	UJ	C	Calibration Noncompliance
29SS0020004	CARBAZOLE	UG/KG	62	J	P	Uncertainty Near Detection Limit

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0020004	DIBENZO(A,H)ANTHRACENE	UG/KG	52	J	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0020004	DIBENZOFURAN	UG/KG	13	J	P	Uncertainty Near Detection Limit
29SS0020004	DRO (C08-C28)	UG/KG	12000	J	R	Surrogate Recovery Noncompliance
29SS0020004	FLUORENE	UG/KG	22	J	P	Uncertainty Near Detection Limit
29SS0020004	HEXACHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	NAPHTHALENE	UG/KG	7.3	UJ	CH	Calibration and Hold Time Noncompliance
29SS0020004	PENTACHLOROPHENOL	UG/KG	87	UJ	CH	Calibration and Hold Time Noncompliance
29SS0040004	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	C	Calibration Noncompliance
29SS0040004	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	2,4-DINITROPHENOL	UG/KG	380	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0040004	2,4-DINITROTOLUENE	UG/KG	19	UJ	C	Calibration Noncompliance
29SS0040004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	94	UJ	C	Calibration Noncompliance
29SS0040004	BENZO(A)ANTHRACENE	UG/KG	35	J	P	Uncertainty Near Detection Limit
29SS0040004	BENZO(G,H,I)PERYLENE	UG/KG	36	J	P	Uncertainty Near Detection Limit
29SS0040004	BENZO(K)FLUORANTHENE	UG/KG	28	J	P	Uncertainty Near Detection Limit
29SS0040004	DIBENZO(A,H)ANTHRACENE	UG/KG	7.6	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0040004	DRO (C08-C28)	UG/KG	5700	J	R	Surrogate Recovery Noncompliance
29SS0040004	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	INDENO(1,2,3-CD)PYRENE	UG/KG	34	J	P	Uncertainty Near Detection Limit
29SS0040004	NAPHTHALENE	UG/KG	7.6	UJ	CH	Calibration and Hold Time Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0040004	PENTACHLOROPHENOL	UG/KG	94	UJ	CH	Calibration and Hold Time Noncompliance
29SS0040004	PHENANTHRENE	UG/KG	24	J	P	Uncertainty Near Detection Limit
29SS0050004	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0050004	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0050004	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0050004	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0050004	2,4-DINITROPHENOL	UG/KG	350	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0050004	2,4-DINITROTOLUENE	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0050004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	C	Calibration Noncompliance
29SS0050004	ACENAPHTHENE	UG/KG	25	J	P	Uncertainty Near Detection Limit
29SS0050004	CARBAZOLE	UG/KG	26	J	P	Uncertainty Near Detection Limit
29SS0050004	DIBENZO(A,H)ANTHRACENE	UG/KG	7	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0050004	DIBENZOFURAN	UG/KG	10	J	P	Uncertainty Near Detection Limit
29SS0050004	DRO (C08-C28)	UG/KG	14000	J	R	Surrogate Recovery Noncompliance
29SS0050004	FLUORENE	UG/KG	21	J	P	Uncertainty Near Detection Limit
29SS0050004	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0050004	NAPHTHALENE	UG/KG	7	UJ	CH	Calibration and Hold Time Noncompliance
29SS0050004	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0060002	1,2,4,5-TETRACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0060002	1,2-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	1,3-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0060002	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0060002	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0060002	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0060002	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,4-DINITROPHENOL	UG/KG	370	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0060002	2,4-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,6-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-CHLORONAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-METHYLNAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	3-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	93	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0060002	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4-CHLOROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4-NITROPHENOL	UG/KG	370	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0060002	ACENAPHTHENE	UG/KG	19	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0060002	ACENAPHTHYLENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	ANTHRACENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	BENZO(A)ANTHRACENE	UG/KG	51	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(A)PYRENE	UG/KG	69	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(B)FLUORANTHENE	UG/KG	160	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(G,H,I)PERYLENE	UG/KG	98	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(K)FLUORANTHENE	UG/KG	66	J	CNR	Calibration, Internal Standard, Surrogate Recovery Noncompliance
29SS0060002	CARBAZOLE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	CHRYSENE	UG/KG	79	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	DIBENZO(A,H)ANTHRACENE	UG/KG	7.5	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0060002	DIBENZOFURAN	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	DRO (C08-C28)	UG/KG	14000	J	R	Surrogate Recovery Noncompliance
29SS0060002	FLUORANTHENE	UG/KG	59	J	R	Surrogate Recovery Noncompliance
29SS0060002	FLUORENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0060002	INDENO(1,2,3-CD)PYRENE	UG/KG	71	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	N-NITROSODIPHENYLAMINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	NAPHTHALENE	UG/KG	7.5	UJ	CH	Calibration and Hold Time Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0060002	NITROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	PENTACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	PENTACHLOROPHENOL	UG/KG	93	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0060002	PHENANTHRENE	UG/KG	37	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0060002	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	PYRENE	UG/KG	170	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0070002	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0070002	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0070002	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0070002	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0070002	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,4-DINITROPHENOL	UG/KG	370	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0070002	2,4-DINITROTOLUENE	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0070002	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0070002	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	92	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0070002	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4-NITROPHENOL	UG/KG	370	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	ACENAPHTHENE	UG/KG	11	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	ANTHRACENE	UG/KG	22	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	BENZO(A)ANTHRACENE	UG/KG	56	J	R	Surrogate Recovery Noncompliance
29SS0070002	BENZO(A)PYRENE	UG/KG	54	J	R	Surrogate Recovery Noncompliance
29SS0070002	BENZO(B)FLUORANTHENE	UG/KG	87	J	R	Surrogate Recovery Noncompliance
29SS0070002	BENZO(G,H,I)PERYLENE	UG/KG	36	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	BENZO(K)FLUORANTHENE	UG/KG	38	J	R	Surrogate Recovery Noncompliance
29SS0070002	CARBAZOLE	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	CHRYSENE	UG/KG	67	J	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0070002	DIBENZO(A,H)ANTHRACENE	UG/KG	7.4	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0070002	DIBENZOFURAN	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	DRO (C08-C28)	UG/KG	4900	J	R	Surrogate Recovery Noncompliance
29SS0070002	FLUORANTHENE	UG/KG	120	J	R	Surrogate Recovery Noncompliance
29SS0070002	FLUORENE	UG/KG	8.1	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0070002	INDENO(1,2,3-CD)PYRENE	UG/KG	31	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	NAPHTHALENE	UG/KG	7.4	UJ	H	Hold Time Exceedance
29SS0070002	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	PENTACHLOROPHENOL	UG/KG	92	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0070002	PHENANTHRENE	UG/KG	100	J	R	Surrogate Recovery Noncompliance
29SS0070002	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	PYRENE	UG/KG	200	J	R	Surrogate Recovery Noncompliance
29SS0080004	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0080004	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0080004	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0080004	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0080004	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0080004	2,4-DINITROTOLUENE	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0080004	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0080004	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	ACENAPHTHENE	UG/KG	35	J	R	Surrogate Recovery Noncompliance
29SS0080004	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	ANTHRACENE	UG/KG	57	J	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0080004	BENZO(A)ANTHRACENE	UG/KG	140	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(A)PYRENE	UG/KG	110	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(B)FLUORANTHENE	UG/KG	180	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(G,H,I)PERYLENE	UG/KG	68	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(K)FLUORANTHENE	UG/KG	85	J	R	Surrogate Recovery Noncompliance
29SS0080004	CARBAZOLE	UG/KG	46	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0080004	CHRYSENE	UG/KG	130	J	R	Surrogate Recovery Noncompliance
29SS0080004	DIBENZO(A,H)ANTHRACENE	UG/KG	24	J	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0080004	DIBENZOFURAN	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0080004	DRO (C08-C28)	UG/KG	3400	U	A	Laboratory Blank Contamination
29SS0080004	FLUORANTHENE	UG/KG	270	J	R	Surrogate Recovery Noncompliance
29SS0080004	FLUORENE	UG/KG	28	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0080004	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0080004	INDENO(1,2,3-CD)PYRENE	UG/KG	52	J	R	Surrogate Recovery Noncompliance
29SS0080004	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	NAPHTHALENE	UG/KG	7.1	UJ	H	Hold Time Exceedance
29SS0080004	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0080004	PHENANTHRENE	UG/KG	280	J	R	Surrogate Recovery Noncompliance
29SS0080004	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	PYRENE	UG/KG	460	J	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0090004	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0090004	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0090004	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0090004	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0090004	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0090004	2,4-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	CR	Calibration and Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0090004	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	ACENAPHTHENE	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0090004	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	ANTHRACENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	BENZO(A)ANTHRACENE	UG/KG	31	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0090004	BENZO(A)PYRENE	UG/KG	38	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	BENZO(B)FLUORANTHENE	UG/KG	70	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	BENZO(G,H,I)PERYLENE	UG/KG	69	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	BENZO(K)FLUORANTHENE	UG/KG	33	J	CNPR	Calibration, Internal Standard, Surrogate Recovery Noncompliance and Uncertainty Near Detection Limit
29SS0090004	CARBAZOLE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	CHRYSENE	UG/KG	54	J	R	Surrogate Recovery Noncompliance
29SS0090004	DIBENZO(A,H)ANTHRACENE	UG/KG	7.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0090004	DIBENZOFURAN	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	DRO (C08-C28)	UG/KG	45000	J	R	Surrogate Recovery Noncompliance
29SS0090004	FLUORANTHENE	UG/KG	30	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0090004	FLUORENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	HEXACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0090004	INDENO(1,2,3-CD)PYRENE	UG/KG	40	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	NAPHTHALENE	UG/KG	7.1	UJ	H	Hold Time Exceedance
29SS0090004	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0090004	PHENANTHRENE	UG/KG	26	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0090004	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	PYRENE	UG/KG	100	J	R	Surrogate Recovery Noncompliance
29SS0100002	1,2,4,5-TETRACHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	1,2,4-TRICHLOROBENZENE	UG/KG	35	UJ	H	Hold Time Exceedance
29SS0100002	1,2-DICHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	1,3-DICHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	1,4-DICHLOROBENZENE	UG/KG	35	UJ	H	Hold Time Exceedance
29SS0100002	2,3,4,6-TETRACHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4,5-TRICHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4,6-TRICHLOROPHENOL	UG/KG	35	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0100002	2,4-DICHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4-DIMETHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0100002	2,4-DINITROTOLUENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,6-DICHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0100002	2,6-DINITROTOLUENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-CHLORONAPHTHALENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-CHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-METHYLNAPHTHALENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-METHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-NITROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-NITROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	3-METHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	3-NITROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	87	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0100002	4-CHLORO-3-METHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4-CHLOROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4-NITROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	ACENAPHTHENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	ACENAPHTHYLENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	ANTHRACENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	BENZO(A)ANTHRACENE	UG/KG	11	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	BENZO(A)PYRENE	UG/KG	7.3	J	CPR	Calibration, Surrogate Recovery Noncompliance and Uncertainty Near Detection Limit
29SS0100002	BENZO(B)FLUORANTHENE	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	BENZO(G,H,I)PERYLENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	BENZO(K)FLUORANTHENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0100002	CARBAZOLE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	CHRYSENE	UG/KG	8	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	DIBENZO(A,H)ANTHRACENE	UG/KG	14	UJ	CH	Calibration and Hold Time Noncompliance
29SS0100002	DIBENZOFURAN	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	DRO (C08-C28)	UG/KG	3600	U	A	Laboratory Blank Contamination
29SS0100002	FLUORANTHENE	UG/KG	20	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	FLUORENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	HEXACHLOROBENZENE	UG/KG	35	UJ	H	Hold Time Exceedance
29SS0100002	INDENO(1,2,3-CD)PYRENE	UG/KG	35	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	N-NITROSODIPHENYLAMINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	NAPHTHALENE	UG/KG	14	UJ	H	Hold Time Exceedance
29SS0100002	NITROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	PENTACHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	PENTACHLOROPHENOL	UG/KG	170	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0100002	PHENANTHRENE	UG/KG	7.3	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	PHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	PYRENE	UG/KG	10	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002-D	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SS0100002-D	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SS0100002-D	2,3,4,6-TETRACHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4,5-TRICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0100002-D	2,4-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4-DIMETHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4-DINITROPHENOL	UG/KG	400	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0100002-D	2,6-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2-CHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2-NITROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	4,6-DINITRO-2-METHYLPHENOL	UG/KG	99	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0100002-D	4-CHLORO-3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	4-NITROPHENOL	UG/KG	400	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	BENZO(A)PYRENE	UG/KG	8	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0100002-D	DIBENZO(A,H)ANTHRACENE	UG/KG	8	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0100002-D	DRO (C08-C28)	UG/KG	2600	U	A	Laboratory Blank Contamination
29SS0100002-D	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SS0100002-D	NAPHTHALENE	UG/KG	8	UJ	CH	Calibration and Hold Time Noncompliance
29SS0100002-D	PENTACHLOROPHENOL	UG/KG	99	UJ	CH	Calibration and Hold Time Noncompliance
29SS0100002-D	PHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0110002	1,2,4-TRICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0110002	1,4-DICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0110002	2,4,5-TRICHLOROPHENOL	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0110002	2,4,6-TRICHLOROPHENOL	UG/KG	17	UJ	H	Hold Time Exceedance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0110002	2,4-DINITROPHENOL	UG/KG	350	UJ	C	Calibration Noncompliance
29SS0110002	2,4-DINITROTOLUENE	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0110002	3-METHYLPHENOL	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0110002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	87	UJ	C	Calibration Noncompliance
29SS0110002	ACENAPHTHENE	UG/KG	7.3	J	P	Uncertainty Near Detection Limit
29SS0110002	ANTHRACENE	UG/KG	19	J	P	Uncertainty Near Detection Limit
29SS0110002	BENZO(A)ANTHRACENE	UG/KG	63	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(A)PYRENE	UG/KG	65	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(B)FLUORANTHENE	UG/KG	130	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(G,H,I)PERYLENE	UG/KG	41	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(K)FLUORANTHENE	UG/KG	43	J	N	Internal Standard Noncompliance
29SS0110002	CARBAZOLE	UG/KG	14	J	P	Uncertainty Near Detection Limit
29SS0110002	CHRYSENE	UG/KG	81	J	N	Internal Standard Noncompliance
29SS0110002	DIBENZO(A,H)ANTHRACENE	UG/KG	24	J	H	Hold Time Exceedance
29SS0110002	DRO (C08-C28)	UG/KG	3700	J	R	Surrogate Recovery Noncompliance
29SS0110002	HEXACHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0110002	INDENO(1,2,3-CD)PYRENE	UG/KG	36	J	N	Internal Standard Noncompliance
29SS0110002	NAPHTHALENE	UG/KG	7	UJ	H	Hold Time Exceedance
29SS0110002	PENTACHLOROPHENOL	UG/KG	87	UJ	H	Hold Time Exceedance
29SS0110002	PYRENE	UG/KG	230	J	N	Internal Standard Noncompliance

TABLE 3-1

QUALIFIED DATA FOR SOIL SAMPLES
RFI SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION

UG/KG - microgram per kilogram

U - undetected

J - estimated

Qualifier Codes -

A - Laboratory blank contamination

C - Calibration non-compliance

CE - Calibration and LCS/LCSD Recovery Noncompliance

CER - Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance

CH - Calibration and Hold Time Noncompliance

CHR - Calibration, Hold Time, and Surrogate Recovery Noncompliance

CNPR - Calibration, Internal Standard, Surrogate Recovery Noncompliance and Uncertainty Near Detection Limit

CPR - Calibration, Surrogate Recovery Noncompliance and Uncertainty Near Detection Limit

CR - Calibration and Surrogate Recovery Noncompliance

H - Hold time exceedance

HN - Hold Time Exceedance and Internal Standard Noncompliance

N - Internal Standard Noncompliance

P - Uncertainty near detection limit

PR - Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance

R - Surrogate Recovery Noncompliance

TABLE 3-2

RANGE OF NONDETECT VALUES FOR SOIL SAMPLES
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Parameter	Lowest Risk-Based Criterion	Range of Nondetect Values (µg/kg)	Comments (excludes two field duplicates)
PENTACHLOROPHENOL	28	87 - 200	Three LODs greater than 100 ug/kg
1,4-DICHLOROBENZENE	8.2	17 - 40	Three LODs greater than 25 ug/kg
2,4-DIMETHYLPHENOL	10	17 - 21	Five LODs greater than 19 ug/kg
2-CHLORONAPHTHALENE	12.2	17 - 21	Five LODs greater than 19 ug/kg
4-CHLOROANILINE	2.8	17 - 21	All LODs greater than 10 ug/kg
BENZO(A)PYRENE	15	7.1 - 16	One LOD greater than 15 ug/kg
DIBENZO(A,H)ANTHRACENE	15	7.0 - 36	Two LODs greater than 15 ug/kg
HEXACHLOROBENZENE	10.6	17 - 40	Three LODs greater than 25 ug/kg
NAPHTHALENE	9.4	7.0 - 20	One LOD greater than 18 ug/kg
NITROBENZENE	1.58	17 - 21	All LODs greater than 5 ug/kg

4.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

4.1 PHYSIOGRAPHY AND TOPOGRAPHY

NSA Crane is located in the unglaciated area of the Crawford Uplands Physiographic Province. This province is a rugged, highly vegetated, dissected plateau bounded by the Mitchell Plain Physiographic Province to the east and the Wabash Lowland Physiographic Province to the west (Tetra Tech, 2001). The Mitchell Plain is a low, dissected limestone plateau characterized by sinkholes and karst topographic features. The boundary between the Crawford Upland and the Mitchell Plain is marked by the highly irregular, eastern-facing Chester Escarpment. Springs, caverns, caves, and other solution weathering features can be found along this escarpment and on the eastern edge of the NSA Crane facility. The boundary between the Crawford Upland and the Wabash Lowland near the western boundary of NSA Crane is gradual (Tetra Tech, 2001). The terrain is predominantly rolling with moderately incised stream valleys throughout and occasional flat areas in the central and northern portions of NSA Crane (Figure 4-1). The elevations across NSA Crane range from about 500 feet above mean sea level (amsl) to about 850 feet amsl. Topographic relief in the Crawford Upland generally ranges from 100 to 350 feet. Greater relief exists in the eastern part of NSA Crane near the Chester Escarpment (Tetra Tech, 2001).

SWMU 29 is contained within the boundary of NSA Crane and is located just south of Lake Greenwood in the northwest portion of the base (see Figure 1-1). Lake Greenwood is located 800 feet to the northwest of the boundary of SWMU 29 (See Figure 1-2).

The topography within the SWMU 29 boundary consists of steep terrain, which generally dips from the southeast to the northwest, toward an unnamed creek that drains towards Lake Greenwood (Figure 1-3). The topography dips from a high elevation of 740 feet amsl to a low elevation of 680 amsl, with an average gradient of 0.186 feet/feet. The southeastern portion of SWMU 29 borders a parking lot and is a grassy area dissected by a gravel access road; the northwestern corner of SWMU 29 is within a grassy easement; and the majority of SWMU 29 is woodlands. The location of the former PCP Dip Tank was at the higher elevation of SWMU 29, as shown on Figure 1-3.

4.2 METEOROLOGY

NSA Crane is located in a warm, temperate climatic zone. In general, the summers are warm and humid, and winters are mild with occasional short cold periods. The temperature ranges from an average maximum July temperature of 89 degrees Fahrenheit (°F) to an average minimum January temperature of 26°F. Precipitation is evenly distributed throughout the calendar year; the maximum precipitation

occurs during the spring and early summer. The total average annual precipitation at the facility is 44 inches and consists of 42 inches of rain and 15 inches of snow. The average humidity ranges from 40 to 90 percent in summer and 60 to 90 percent in winter. Long-term climatological records for the area indicate that the monthly prevailing wind direction is from the southwest during April through December and from the northwest during January through March [National Oceanic and Atmospheric Administration (NOAA), 1988]. The annual prevailing wind direction for the region is from the southwest, and the annual average wind speed for the area is about 9.6 miles per hour.

4.3 SURFACE WATER HYDROLOGY

Intermittent streams (drainage ditches) are located southwest, northwest, and northeast of SWMU 29 (see Figure 1-3). Based on the topography, the primary direction of overland flow would be toward the northwest. However, some secondary overland flow would also be expected in the southwest and northeast directions toward the drainage ditches. Eventually, all the streams flow into an unnamed creek that drains into Lake Greenwood at an elevation of 600 feet amsl at its southern bank, which is 800 feet northwest of SWMU 29 (see Figure 1-2).

4.4 GEOLOGY

NSA is underlain by sedimentary rocks of lower Pennsylvanian and upper Mississippian Ages. With the exception of minor outwash and lacustral deposits in the northwest corner of the facility, there are no Pleistocene glacial deposits covering the site. Surface deposits at NSA consist of recent (Holocene) and Pleistocene unconsolidated alluvial silt, sand, and gravel and residual soils developed from the underlying rock. The sedimentary bedrock beneath the facility dips gently to the west - southwest. The inclination of the strata reflects NSA's location on the eastern flank of the Illinois Basin. This section of the basin comprises Pennsylvanian and Mississippian strata consisting of shale, sandstone, limestone, and coal (Pennsylvanian) bells. The Pennsylvanian Mansfield Formation (Raccoon Creek Group) unconformably overlies the Mississippian (Stephensport and West Baden Groups) at the site (PR, 1987).

According to Figure 4-1, Surficial Geology Map, SWMU 29 lies in the Raccoon Creek Group Unit (Source: Background Soils Report. Tetra Tech, 2001). The inferred depositional environment of the Raccoon Creek Group is residual soil derived from Pennsylvanian bedrock/colluviums.

Raccoon Creek Group (Mansfield Formation) consists of shale, sandstone, limestone, clay, and coal. The maximum thickness is 450 feet at NSA south and 100 feet at NSA north. Raccoon Creek Group forms the surface unit in much of the outcrop area; the remainder is covered by unconsolidated deposits,

derived from the underlying bedrock. Raccoon Creek Group is underlain by the West Baden Group (NSA north) through Lower Buffalo Wallow Group (NSA south). In NSA north, Raccoon Creek Group consists of about 55 feet of shale, 40 feet of sandstone, 5 feet of other bedrock types. Coal beds are as thick as 7 feet in some areas. Clay beds as thick as 10 feet underlie coals. Limestone beds are 3 to 10 feet thick (PR, 1987).

The Mansfield Formation of the Raccoon Group has two distinct vertical divisions. The lower division primarily comprises sandstone, while the upper division predominantly consists of shale and mudstone. Thin bituminous coal beds are prevalent throughout the formation.

Four geologic cross sections (A-A', B-B', C-C', and D-D') were developed during the RFI to illustrate the subsurface materials underlying SWMU 29. Figure 4-2 shows the locations of the generalized cross sections, and the cross sections are presented on Figures 4-3 through 4-6. Boring logs are included in Appendix B.1.

In addition to native soil, the soil present beneath the surface of SMWU 29 consists of fill material, which was observed at all soil sampling locations. The surface soil sample total depth varied from 0 to 1.5 feet to 0 to 4 feet bgs, depending on the amount of fill material encountered. The fill material consisted of gravel and sand, but asphalt was also present throughout. The subsurface soil samples collected were the depth just beneath the fill material to bedrock refusal. Natural unconsolidated materials representative of the eroded bedrock underlie the fill and exist at the ground surface where fill is not present. The subsurface soil encountered include varying amounts of sand, silt, and clay. The deepest overburden soil material encountered prior to bedrock refusal was at a depth of 6.5 feet bgs at 29SB-06, the most upgradient soil sampling location. The shallowest overburden soil material encountered prior to bedrock refusal was at a depth of 2.7 feet bgs at 29SB-11, the most downgradient soil sampling location. This is shown in the boring logs in Appendix B.1 and illustrated on the geologic cross sections shown in Figures 4-3 through 4-6.

4.5 HYDROGEOLOGY

According to the Naval Assessment and Control of Installation Pollutants (NACIP), the groundwater at NSA is divided into two regimes: one associated with soil/alluvial cover and the other associated with the bedrock. This study reports that shallow groundwater is generally transient, occurring during high precipitation periods. Free water within alluvial deposits is likely to percolate into bedrock or be discharged into intermittent streams along alluvial - bedrock contacts.

General water bearing properties of the alluvial deposits and bedrock at NSA were adapted from the NACIP study (A.T. Kearney, 1987). Wells in thick sandstone beds in the lower part of the Raccoon Group may yield water in a quantity adequate for domestic, light industrial, or small municipal use. Quality is generally good, but in areas of surface and underground coal mining, contamination may be severe. Principal contaminants are sulphur and iron. Sulphur content, principally as sulphate, may be as high as a few thousand parts per million; iron content may be as high as 50 parts per million (A.T. Kearney, 1987).

Groundwater resources at NSA Crane have not been studied extensively because the facility utilizes surface waters from Lake Greenwood for human consumption, process operations, and recreation. However, the existing lithologies, occurrences of springs and seeps, and the well developed surface drainage indicate the existence of groundwater hydraulically connected to the surface environment.

Groundwater at SWMU 29 is not currently used and not likely to be used in the future. Lake Greenwood, an 800-acre, man-made, spring-fed lake in the northwestern portion of the installation (Figure 1-2) is the main source of drinking water at NSA Crane and is expected to remain as such in the future.

Groundwater was not addressed in this RFI. Sampling was limited to soil only. Due to the lateral lithologic transitions, the hydraulic isolation between alternating sedimentary series is not probable. Groundwater within the bedrock is likely to continue percolating downgradient until a permanent zone of saturation is reached. Dependent on potentiometric heads, groundwater could also have a vertical flow component as it moves downgradient. Generally, the direction of groundwater flow should be controlled by the regional dip toward the west and will locally follow the topography (A.T. Kearney, 1987). Shallow groundwater would follow the topography, which declines steeply from SWMU 29 toward Lake Greenwood.

4.6 DEMOGRAPHY AND LAND USE

The economic base of communities surrounding NSA Crane is in transition from agriculture, mining, and quarrying to manufacturing and service industries. The patterns of settlement, population statistics, and median income are similar throughout the region. Because most of the region is covered by vegetation, the area is classified as rural.

There is no state or local planning within the vicinity of NSA Crane. The only zoning and land use regulations are in the municipalities in the region. None of the municipalities are close enough to impact

NSA Crane. None of the areas adjacent to NSA Crane are zoned, and zoning is not anticipated in the near future. No known land use or community actions are being considered or proposed at this time.

4.7 ECOLOGY

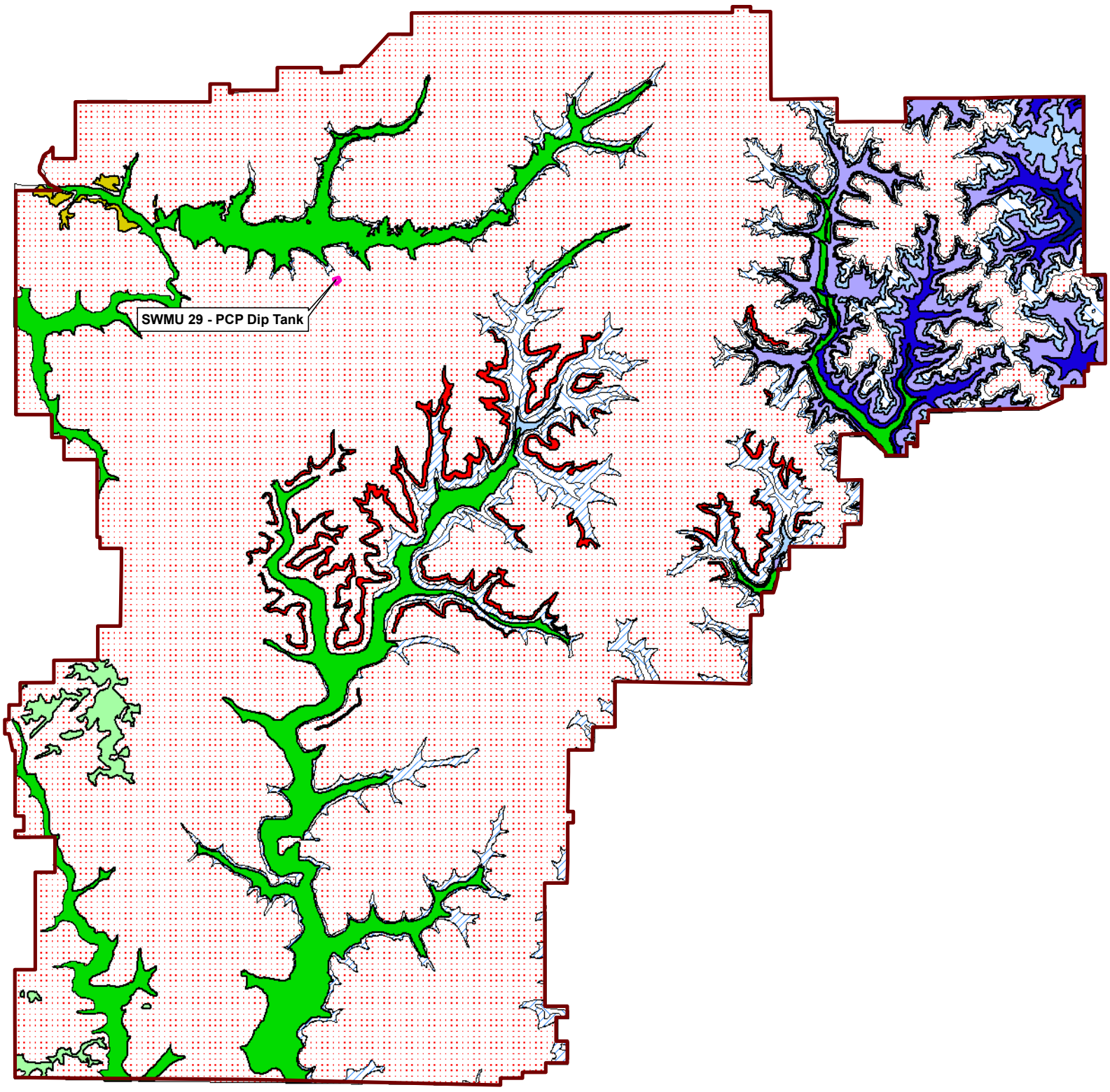
SWMU 29 is an industrial area that does not support ecological receptors. However, nearby terrestrial habitats (i.e., wooded and grassy areas) may provide shelter and food sources for various species of mammals such as white-tailed deer, coyote, red fox, rabbits, raccoons, and mice, and for birds such as ducks, geese, wild turkey, bobwhite quail, red-tailed hawks, and American robins.

The white-tailed deer is the most conspicuous large, wild mammal at the installation. Other mammals include opossum, raccoon, rabbits, mice, bats, chipmunks, squirrels, beaver, groundhogs, gray fox, coyotes, and long-tailed weasel. Fox, coyotes, and hawks are carnivores whose presence indicates a healthy ecosystem with smaller mammals present to provide a food source (NEESA, 1983).

The birds at NSA Crane are diverse. Previous studies identified over 100 species present at the facility during breeding seasons (Hengeveld, 1987). Because the facility is largely forested, the species found consist predominantly of those that frequent wooded habitat types. Species of waterfowl also use the facility, especially in the vicinity of Greenwood Lake (Figure 1-2). A large number of bird species frequent the non-forested grassland, oldfield, and scrub/shrub vegetation present over portions of NSA Crane.

Previous studies conducted at NSA Crane (Nelson et al., 1987) identified 21 amphibian species and 22 reptilian species including skinks, lizards, snakes, and turtles.

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU29_SURFGEO.MXD 02/20/12 JEE



Inferred Depositional Environment		Explanation of Geology
Alluvium	Qal	*Alluvium*
Loess/Glacial Outwash	Ql	*Loess*
	Qo	*Glacial Outwash*
Residual Soil derived from Pennsylvanian bedrock/colluvium	P	*Raccoon Creek Group and undifferentiated*
	Ps	*Sandstone-dominated horizon of Lower Pennsylvanian*
Residual soil derived from Mississippian bedrock/colluvium	M6	*Glenn Dean Ls, Hardinsburg Fm, Haney Ls, Indian Springs Shale Mbr, and undifferentiated*
	M5	*Sandstone member of the Big Clifty Fm*
	M4	*Beech Creek Ls*
	M3	*Elwren Fm, Reelsville Ls, upper Sample Fm, and undifferentiated*
	M2	*Lower part of Sample Fm, Beaver Bend Ls, Bethel Fm, and undifferentiated*
	M1	*Paoli Ls, Ste Genevieve Ls, and undifferentiated*

Source: Background Soils Report. TtNUS 2001. (Modified from Blunck, 1995).

Legend

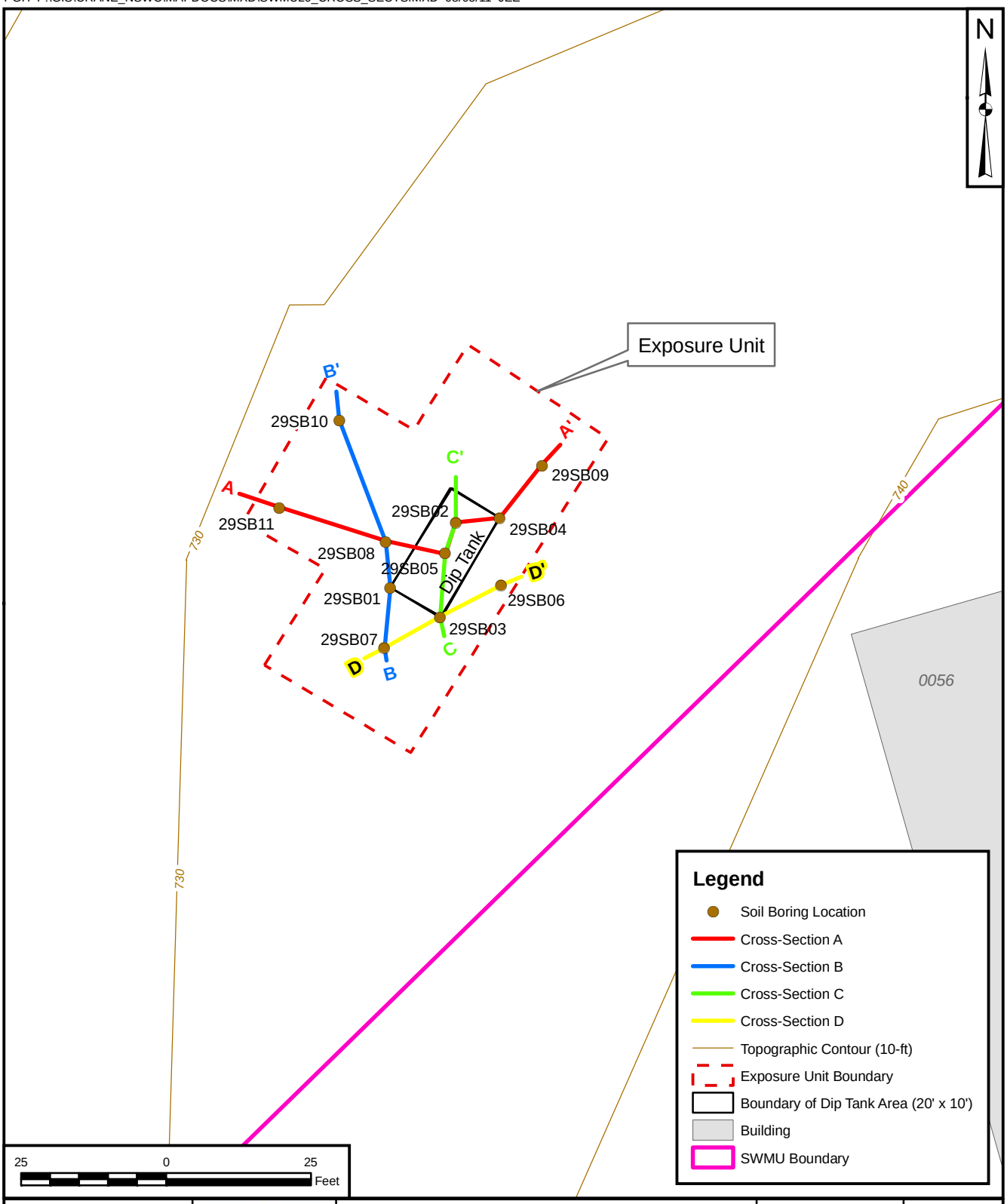
SWMU 29 Boundary

Installation Area

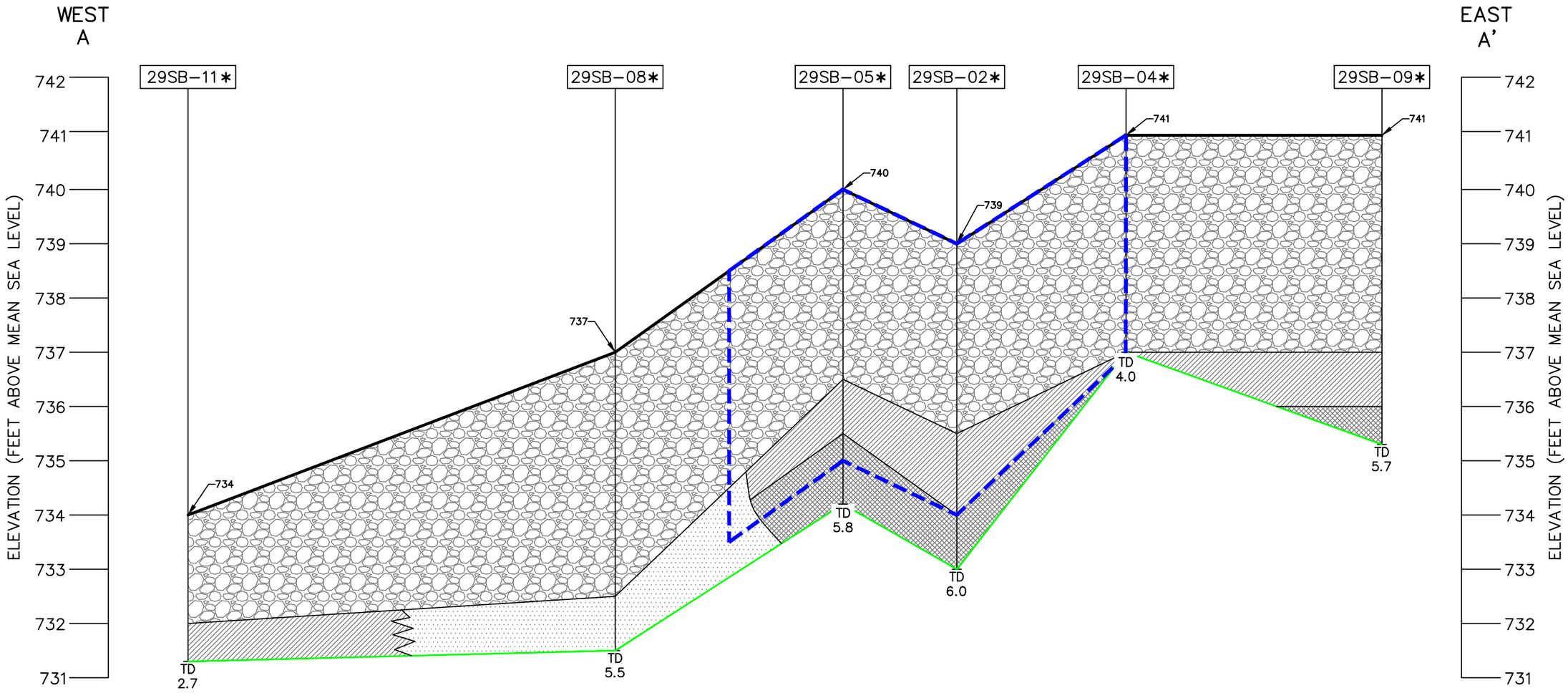
1.5 0 1.5 Miles

DRAWN BY: S. STROZ	DATE: 08/01/11	TETRA TECH	CONTRACT NUMBER: 3137 / CTO NUMBER: F27N
CHECKED BY: E. BERKLITE	DATE: 02/20/12	SURFICIAL GEOLOGY MAP SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	APPROVED BY: — / DATE: —
REVISED BY: —	DATE: —		APPROVED BY: — / DATE: —
SCALE: AS NOTED			FIGURE NO.: FIGURE 4-1 / REV: 0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU29_CROSS_SECTS.MXD 08/05/11 JEE



DRAWN BY: S. STROZ	DATE: 08/01/11	CROSS-SECTION LOCATIONS SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	CONTRACT NUMBER: 3137 / CTO NUMBER: F27N
CHECKED BY: E. BERKLITE	DATE: 08/05/11		APPROVED BY: ___ / DATE: ___
REVISED BY: ___	DATE: ___		APPROVED BY: ___ / DATE: ___
SCALE: AS NOTED			FIGURE NO.: FIGURE 4-2 / REV: 0



LEGEND:

MONITORING WELL OR BORING NUMBER — 29SB–11

GROUND SURFACE ELEVATION — 734

LITHOLOGIC CONTACT (INFERRED BETWEEN BORINGS)

TOTAL DEPTH OF WELL OR BORING (FT BGS) — TD 2.7

- WELL–GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
- CLAYEY SANDS, SAND–CLAY MIXTURES
- INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
- * ELEVATIONS BASED ON TOPOGRAPHIC MAP
- TOP OF BEDROCK (INFERRED)
- APPROXIMATE FORMER LOCATION OF PCP TANK
- WELL–GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES (FILL MATERIAL)

0 5 10
HORIZONTAL SCALE: 1" = 5'

0 2 4
VERTICAL SCALE: 1" = 2'

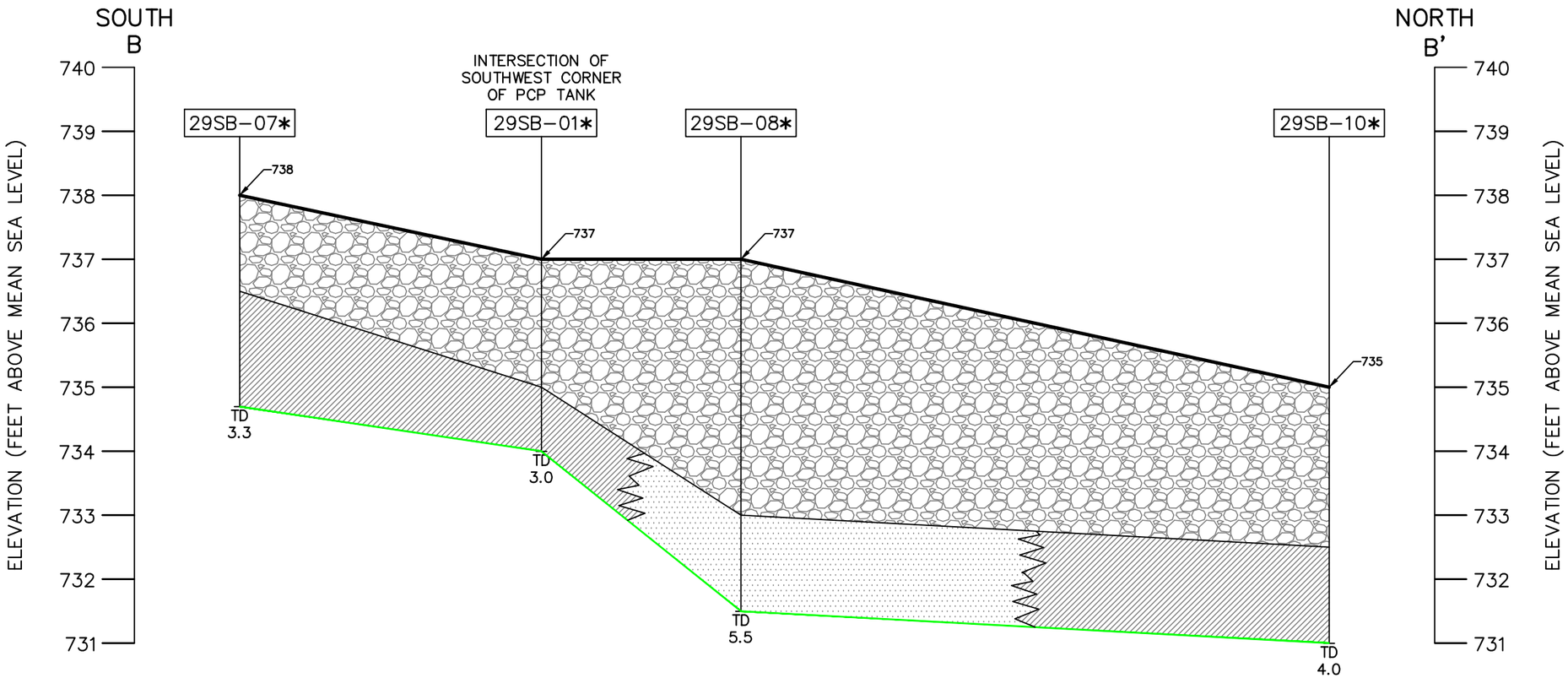
DRAWN BY ND	DATE 8–5–11
CHECKED BY	DATE
REVISED BY	DATE
SCALE AS NOTED	

NAVFAC

GEOLOGICAL CROSS SECTION A–A'
SWMU 29
PCP DIP TANK
NSA CRANE
CRANE, INDIANA

CONTRACT NO. 3137	
OWNER NO.	
APPROVED BY	DATE
DRAWING NO. FIGURE 4–3	REV. 0

R:\3137 – Crane\Civil\3137CX01.dwg PIT NICHOLE.DILLA 8/8/2011 8:10:20 AM



LEGEND:

MONITORING WELL OR BORING NUMBER — 29SB–07

GROUND SURFACE ELEVATION — 738

LITHOLOGIC CONTACT (INFERRED BETWEEN BORINGS)

TOTAL DEPTH OF WELL OR BORING (FT BGS) — TD 3.3

- WELL–GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
- WELL–GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES (FILL MATERIAL)
- INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
- * ELEVATIONS BASED ON TOPOGRAPHIC MAP
- TOP OF BEDROCK (INFERRED)

0 5 10
HORIZONTAL SCALE: 1" = 5'

0 2 4
VERTICAL SCALE: 1" = 2'

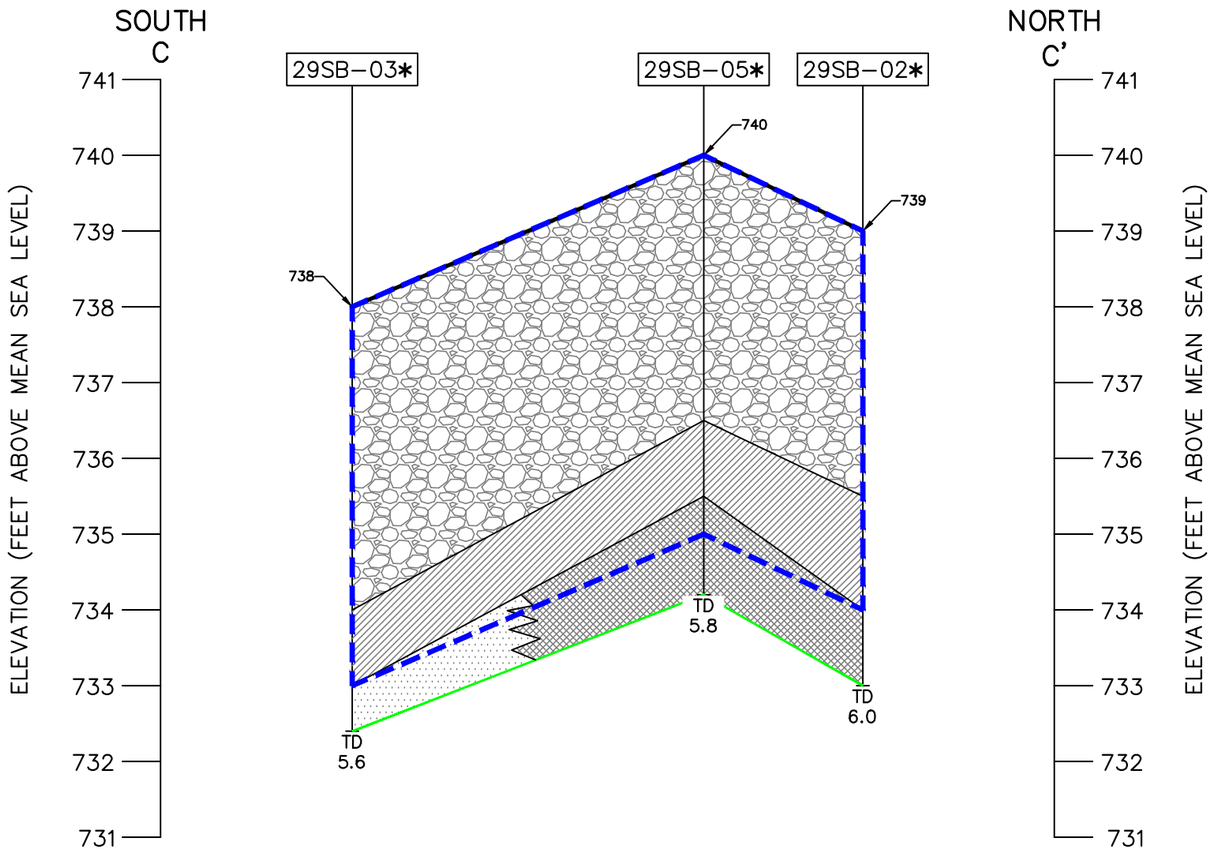
DRAWN BY CK	DATE 8–5–11
CHECKED BY	DATE
REVISED BY	DATE
SCALE AS NOTED	

NAVFAC

GEOLOGICAL CROSS SECTION B–B'
SWMU 29
PCP DIP TANK
NSA CRANE
CRANE, INDIANA

CONTRACT NO. 3137	
OWNER NO.	
APPROVED BY	DATE
DRAWING NO. FIGURE 4–4	REV. 0

R:\3137 – Crane\Civil\3137CX02.dwg PIT NICHOLE.DILLA 8/8/2011 8:13:11 AM



LEGEND:

MONITORING WELL OR BORING NUMBER — 29SB–03

GROUND SURFACE ELEVATION — 738

LITHOLOGIC CONTACT (INFERRED BETWEEN BORINGS)

TOTAL DEPTH OF WELL OR BORING (FT BGS) — TD 5.6

WELL–GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES

CLAYEY SANDS, SAND–MADE CLAY MIXTURES

INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS

* ELEVATIONS BASED ON TOPOGRAPHIC MAP

TOP OF BEDROCK (INFERRED)

APPROXIMATE FORMER LOCATION OF PCP TANK

WELL–GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES (FILL MATERIAL)

0 5 10
HORIZONTAL SCALE: 1" = 10'

0 2 4
VERTICAL SCALE: 1" = 2'

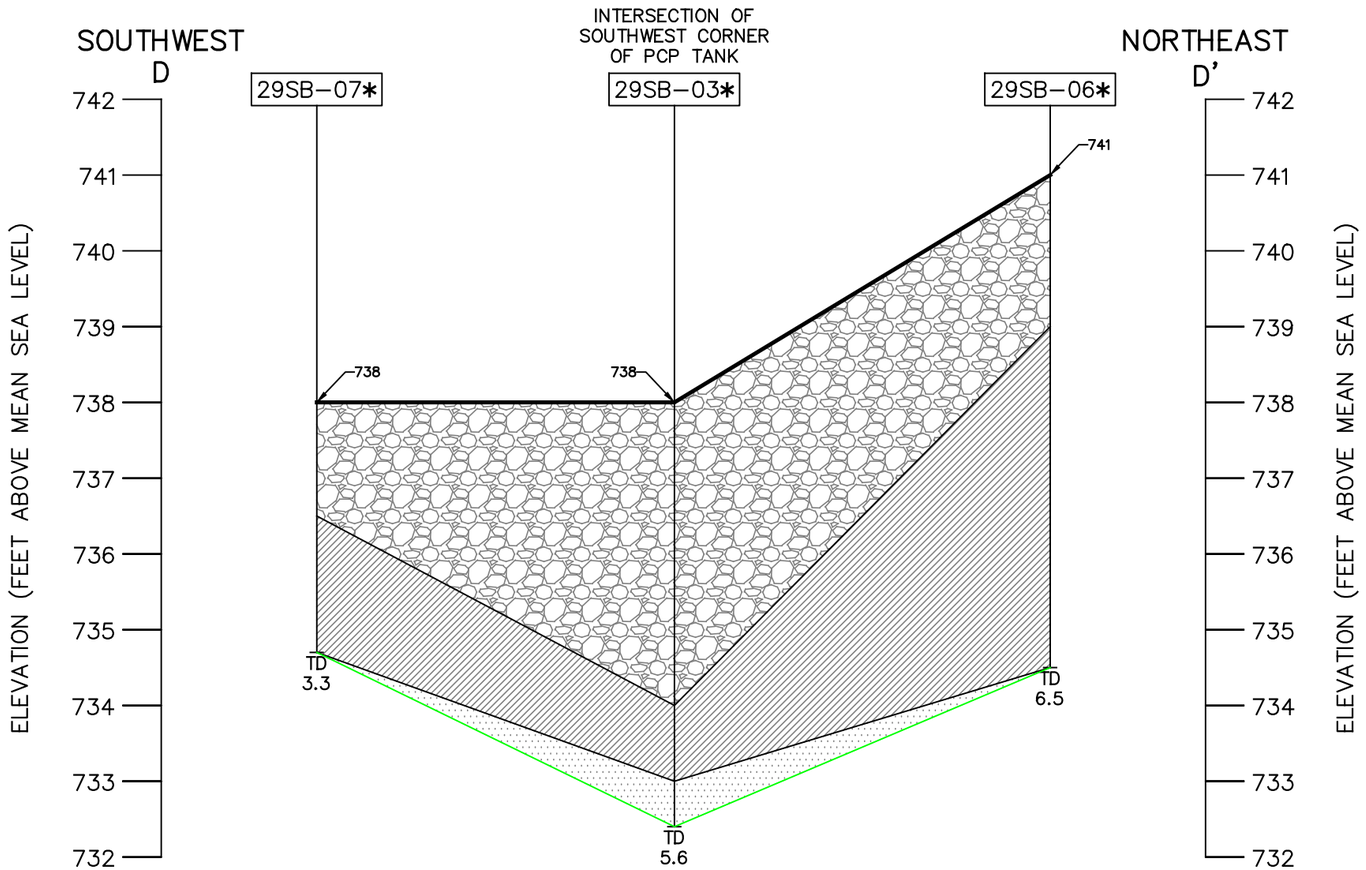
DRAWN BY CK	DATE 8–5–11
CHECKED BY	DATE
REVISED BY	DATE
SCALE AS NOTED	

NAVFAC

GEOLOGICAL CROSS SECTION C–C'
SWMU 29
PCP DIP TANK
NSA CRANE
CRANE, INDIANA

CONTRACT NO. 3137	
OWNER NO.	
APPROVED BY	DATE
DRAWING NO. FIGURE 4–5	REV. 0

R:\3137 – Crane\Civil\3137CX03.dwg PIT NICHOLE.DILLA 8/8/2011 8:15:13 AM



LEGEND:

MONITORING WELL OR BORING NUMBER — 29SB–07

GROUND SURFACE ELEVATION — 738

LITHOLOGIC CONTACT (INFERRED BETWEEN BORINGS)

TOTAL DEPTH OF WELL OR BORING (FT BGS) — TD 3.3

WELL–GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES

WELL–GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES (FILL MATERIAL)

INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS

* ELEVATIONS BASED ON TOPOGRAPHIC MAP

TOP OF BEDROCK (INFERRED)

0 5 10
HORIZONTAL SCALE: 1" = 5'

0 2 4
VERTICAL SCALE: 1" = 2'

DRAWN BY CK	DATE 8–5–11
CHECKED BY	DATE
REVISED BY	DATE
SCALE AS NOTED	

NAVFAC

GEOLOGICAL CROSS SECTION D–D'
SWMU 29
PCP DIP TANK
NSA CRANE
CRANE, INDIANA

CONTRACT NO.	0000
OWNER NO.	0000
APPROVED BY	DATE
DRAWING NO.	FIGURE 4–6
SIZE	B
REV.	0

R:\3137 – Crane\Civil\3137CX04.dwg PIT CARLY.KRAMER 1/19/2012 9:15:37 AM

5.0 NATURE AND EXTENT OF CONTAMINATION

5.1 BACKGROUND

This section describes the locations, spatial patterns, and chemical forms of organic contaminants detected in soils at NSA Crane SWMU 29. Figure 1-1 shows the base and site location, Figure 1-2 shows the location of SWMU 29 relative to NSA Crane drainage basins, and Figure 1-3 shows the former PCP Dip Tank features. Figure 2-1 shows the soil sampling locations at the SWMU 29 PCP Dip Tank.

The analytical data presented in this RFI Report were subjected to a data validation process performed by Tetra Tech personnel for data integrity and defensibility. No data were rejected during the data validation process. Samples collected for chemical analysis during the investigation were analyzed by RTI Analytical for SVOCs, DRO, and PCP. Based on the chemical analyses protocols presented in Worksheet #17 of the UFP-SAP (Tetra Tech, 2011), dioxins and furans were not analyzed, because PCP was not detected in any of the samples. Detected concentrations in analyzed soil samples are discussed in this section.

5.2 SOIL CONTAMINATION

Defined organic chemical contamination for this RFI is chemicals whose concentrations exceed human health or ecological screening values, and therefore, are considered to potentially result in unacceptable human health or ecological risk. The SWMU 29 RFI required the collection of chemical data to be used to characterize the site and conduct a screening level HHRA and ERA. The soil project action limits (PALs) are set at the lowest matrix-specific, risk-based or regulatory human health screening criteria appropriate for the site. The project screening level (PSL) references for surface and subsurface soil for this investigation are as follows (as presented in Worksheet #15, Reference Limits and Evaluation Table in the SWMU 29 UFP-SAP (Tetra Tech, 2011):

- Risk-Based Soil Screening Level – United States Environmental Protection Agency (RBSSL – USEPA) Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, Dilution Attenuation Factor (DAF) = 20 (USEPA, 2010);

- Residential Regional Screening Level (R-RSL) - USEPA Regions 3, 6, and 9 RSL for Soil, Residential Direct Contact (R-DCL), adjusted to 1/10 of value for non-carcinogens (USEPA, 2010);

- R-DCL – Indiana Department of Environmental Management (IDEM) Residential Default Closure Level (USEPA, 2009);

- Ecological Soil Screening Levels (Eco-SSL) – (USEPA, 2005-2008);

- Region 5 Ecological Screening Level (R5 ESL-S) – USEPA, Soil (USEPA, 2003).

Refer to Appendix E of the SWMU 29 UFP-SAP (Tetra Tech, 2011) for further explanation and justification of PSLs.

5.2.1 Surface Soil

Statistical summary results for surface soil for SWMU 29 are presented in Table 5-1. The frequency of detections (FODs), as well as minimum and maximum detections, for each screening criteria are identified in the table. The analytical results for surface soil samples collected at SWMU 29 are summarized in Table 5-2 and Figure 5-1. Concentrations that exceeded the minimum regulatory screening criteria are shaded. Soil sample locations are shown on Figure 2-1. Detailed soil analytical results are provided in Appendix C.

Tables 5-1 and 5-2 present the contaminants in surface soil that were detected, the frequency of detection, and the number of concentrations exceeding the minimum human health or ecological screening criteria. Discussions of these detections and exceedances in surface soil are presented in Sections 5.2.1.1 and 5.2.1.2.

5.2.1.1 SVOCs

Table 5-1 indicates that detections of SVOCs, mostly PAHs, in surface soil were widespread throughout the site. The majority of the maximum SVOC concentration results were detected in sample 29SS0020004, located directly beneath the assumed location of the former PCP Dip Tank. Sampling location, 29SS010, located 22 feet northwest of the northwest corner of the former PCP Dip Tank location, had the overall lowest SVOCs concentrations, with either non-detections or detections that were "J" (estimated) qualified, and with no exceedances of screening values. A surface soil was not collected at location 29SB003 due to excessive gravel.

The surface soil positive results compared to human health and ecological screening criteria are presented in Table 5-2. Shaded cells and boldface font indicate that the concentration is greater than the

minimum screening criterion. The exceedances of the minimum regulatory screening criteria for SVOCs in surface soil are shown on Figure 5-1.

Nine of 10 surface soil samples exceeded the minimum regulatory screening values for particular SVOCs. The samples with SVOC exceedances are summarized as follows:

- Benzo(a)anthracene - 280 µg/kg in sample 29SS0020004;

- Benzo(a)pyrene - 79 µg/kg in sample 29SS0010002, 320 µg/kg in sample 29SS0020004, 41 µg/kg in sample 29SS0040004, 110 µg/kg in sample 29SS0050004, 69J µg/kg in sample 29SS0060002, 54J µg/kg in sample 29SS0070002, 110J µg/kg in sample 29SS0080004, 38J µg/kg in sample 29SS0090004, and 65J µg/kg in sample 29SS0110002;

- Benzo(b)fluoranthene - 500 µg/kg in sample 29SS0020004, 180 µg/kg in sample 29SS0050004, 160J µg/kg in sample 29SS0060002, and 180J µg/kg in sample 29SS0080004,

- Dibenzo(a,h)anthracene - 52J µg/kg in sample 29SS0020004, 24J µg/kg in sample 29SS0080004, and 24J µg/kg in sample 29SS0110002.

5.2.1.2 DRO

Table 5-1 indicates that DRO was detected in seven of 10 surface soil samples. Detection of DRO in surface soil was widespread throughout the site. The maximum DRO concentration was 45,000J µg/kg in sample 29SS0090004, located approximately 11 feet northeast of the northeast corner of the former PCP Dip Tank. Samples 29SS0010002, 29SS0080004, and 29SS0100002, all located west of the former PCP Dip Tank, were all nondetect for DRO.

DRO concentrations did not exceed the minimum human health screening values for surface soil in any soil sampling locations.

5.2.1.3 PCP and Related Compounds

No concentrations of PCP or PCP-related compounds were detected above laboratory detection limits in any surface soils.

5.2.2 Subsurface Soil

The statistical summary of subsurface soil results from SWMU 29 is presented in Table 5-3. The FODs, as well as minimum and maximum detections for each screening criteria, are identified in the table. The analytical results for soil samples collected at SWMU 29 are summarized in Table 5-4. Concentrations that exceeded the human health screening criteria are shaded. The subsurface soil samples were not screened against ecological criteria. Soil sample locations are shown on Figure 2-1. Detailed soil analytical results are provided in Appendix C.

Tables 5-3 and 5-4 present the contaminants detected, the frequency of detections, and the number of concentrations exceeding the human health screening in subsurface soil. Discussions of these detections and exceedances in subsurface soil are presented in Sections 5.2.2.1 and 5.2.2.2.

5.2.2.1 SVOCs

The Subsurface Soil Summary table in Section 5.2.2 indicates that detections of SVOCs in subsurface soil were primarily beneath the former PCP Dip Tank location and at one location (29SB011) approximately 22 feet west of the former PCP Dip Tank. The majority of the maximum SVOCs results were in 29SB0050406, collected directly beneath the assumed location of the former PCP Dip Tank. Samples 29SB0020406, 29SB0060206, 29SB0070204, 29SB0080406, 29SB0090406, 29SB0100204 were non-detect for SVOCs. A subsurface sample was not collected at 29SB004 because gravel fill was present until 4 feet bgs (the surface sample depth interval) at which point boring refusal was reached.

The subsurface soil positive results are presented in Table 5-4. Shaded cells indicate that the concentration is greater than the minimum screening criterion. The exceedances of the minimum regulatory screening criteria for SVOCs in subsurface soil are shown on Figure 5-2.

Four of 10 subsurface soil samples exceeded the minimum regulatory screening values for particular SVOCs. The samples with individual SVOC exceedances are summarized as follows:

- Benzo(a)anthracene - 460 µg/kg in sample 29SB0050406, and 640 µg/kg in sample 29SB0110203;
- Benzo(a)pyrene - 42 µg/kg in sample 29SB0010203, 22J µg/kg in sample 29SB0030406, 410 µg/kg in sample 29SB0050406, and 540 µg/kg in sample 29SB0110203;
- Benzo(b)fluoranthene - 540 µg/kg in sample 29SB0050406and 690 µg/kg in sample 29SB0110203;
- Dibenzo(a,h)anthracene - 86 µg/kg in sample 29SB0050406 and 81 µg/kg in sample 29SB0110203;

- Indeno(1,2,3-cd)pyrene - 240 µg/kg in sample 29SB0110203;
- Naphthalene - 11J µg/kg in sample 29SB0050406.

5.2.2.2 Diesel Range Organics

The Subsurface Soil Summary table in Section 5.2.2 above indicates that DRO was detected in 6 of 10 subsurface soil samples. Detection of DRO in subsurface soil was random throughout the site. DRO exceeded the minimum regulatory screening values in surface soil in one soil sample, 29SB0050406, which was collected directly beneath the former PCP Dip Tank location. Samples 29SB0010203, 29SB0020406, 29SB0060206, and 29SB0110203 were all non-detect for DRO.

The subsurface soil positive results are presented in Table 5-4. Shaded cells indicate that the concentration is greater than the minimum screening criterion. The exceedance of the minimum regulatory screening criteria for DRO in subsurface soil is shown on Figure 5-3.

DRO exceeded the minimum regulatory screening values in subsurface soil at the following soil sample location:

- DRO - 310,000J µg/kg in sample 29SB0050406.

5.2.2.3 PCP and Related Compounds

No concentrations of PCP or PCP-related compounds were detected above laboratory detection limits in any subsurface soils.

5.3 SUMMARY

The surface and subsurface soil present at SWMU 29 consists of native soil and fill material, of which the latter was observed at all soil sampling locations at SWMU 29. The surface soil sample total depth varied from 0 to 2 feet to 0 to 4 feet bgs, depending on the amount of fill material encountered. The subsurface soil samples collected were the depth just beneath the fill material to bedrock refusal. The subsurface soil encountered was a mixture of sand, silt, and clay. The deepest overburden soil material encountered prior to bedrock refusal was at a depth of 6.5 feet bgs at 29SB006. This is shown in the boring logs in Appendix B.1 and illustrated on Figures 4-3 through 4-6. Ten surface and 10 subsurface soil samples were collected and analyzed (See Table 2-2).

The initial comparison of the soil results to the minimum regulatory screening criteria (Sections 5.2.1 and 5.2.2) identified a number of exceedances. SVOC concentrations exceeded the minimum human health screening values in surface soil for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene. SVOC concentrations exceeded the minimum human health screening values in subsurface soil for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene. DRO concentrations exceeded the minimum human health screening values in subsurface soil in one soil sample location, 29SB0050406, which was collected directly beneath the former PCP Dip Tank location.

The general area with the highest concentrations of COPCs is the area beneath the location of the former PCP Dip Tank. The soil sampling locations downgradient and west have lower concentrations of COPCs than sampling locations within the area of the former PCP Dip Tank. Although, some residual contamination may be due to operations of the PCP Dip Tank, no PCP was detected in any of the soil samples collected and analyzed. The fill material consisted of gravel and sand, but asphalt was also present throughout. It is most likely that the asphalt debris present in the fill material contributed to the concentrations of SVOC/PAHS detected in soil samples.

TABLE 5-1

FREQUENCY OF DETECTION IN SURFACE SOIL
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Result	Minimum Qualifier	Maximum Result	Maximum Qualifier	Screening Criteria (ug/kg)	Applicable Criteria	Number of Exceedances	Location of Maximum Detection	Sample of Maximum Detection	Minimum Nondetect	Maximum Nondetect	Average of Positive Results	Overall Average	Standard Deviation
MISCELLANEOUS PARAMETERS (%)															
PERCENT MOISTURE	10/10	4.2		12		NA	NA	NA	29SB004	29SS0040004			7.13	7.13	2.85
SEMIVOLATILES (UG/KG)															
ACENAPHTHENE	5/10	7.3	J	36		29000	Eco	0	29SB002	29SS0020004	17	19	22.86	15.98	11.46
ANTHRACENE	6/10	9.7	J	75		29000	Eco	0	29SB002	29SS0020004	17	19	38.78	26.92	24.49
BENZO(A)ANTHRACENE	10/10	11	J	280		150	HH	1	29SB002	29SS0020004			85.40	85.4	78.86
BENZO(A)PYRENE	10/10	7.3	J	320		15	HH	9	29SB002	29SS0020004			89.33	89.33	87.00
BENZO(B)FLUORANTHENE	10/10	15	J	500		150	HH	4	29SB002	29SS0020004			154.40	154.4	132.47
BENZO(G,H,I)PERYLENE	9/10	36	J	180		1100	Eco	0	29SB002	29SS0020004	17	17	76.78	69.95	47.96
BENZO(K)FLUORANTHENE	9/10	28	J	150		1100	Eco	0	29SB002	29SS0020004	17	17	65.89	60.15	40.00
CARBAZOLE	6/10	12	J	62	J	5900	HH	0	29SB002	29SS0020004	17	19	29.17	21.15	18.44
CHRYSENE	10/10	8	J	320		1100	Eco	0	29SB002	29SS0020004			99.90	99.9	85.53
DIBENZO(A,H)ANTHRACENE	3/10	24	J	52	J	15	HH	3	29SB002	29SS0020004	7	36	33.33	14.33	15.79
DIBENZOFURAN	3/10	10	J	15	J	4900	HH	0	29SB008	29SS0080004	17	19	12.67	10.1	2.16
FLUORANTHENE	10/10	20	J	540		29000	Eco	0	29SB002	29SS0020004			152.50	152.5	156.12
FLUORENE	4/10	8.1	J	28	J	29000	Eco	0	29SB008	29SS0080004	17	19	19.78	13.31	7.38
INDENO(1,2,3-CD)PYRENE	9/10	31	J	150		150	HH	0	29SB002	29SS0020004	35	35	59.78	55.55	37.41
PHENANTHRENE	10/10	7.3	J	390		13000	HH	0	29SB002	29SS0020004			124.33	124.33	130.42
PYRENE	10/10	10	J	1100		1100	Eco	0	29SB002	29SS0020004			307.00	307	314.04
PETROLEUM HYDROCARBONS (UG/KG)															
DRO (C08-C28)	7/10	3700	J	45000	J	230000	HH	0	29SB009	29SS0090004	3400	4000	14185.71	10480	13093.75

Associated Samples:
29SS0010002
29SS0020004
29SS0040004
29SS0050004
29SS0060002
29SS0070002
29SS0080004
29SS0090004
29SS0100002
29SS0110002

Notes:

DRO = Diesel Range Organics
J = Value is estimated.
ug/kg = Microgram per kilogram.
Eco = Ecological Screening Criteria
HH = Human Health Screening Criteria

TABLE 5-2

POSITIVE HITS FOR SURFACE SOIL
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

LOCATION	HHRA	ERA	MIN	29SB001		29SB002		29SB004		29SB005		29SB006		29SB007	
SAMPLE ID				29SS0010002		29SS0020004		29SS0040004		29SS0050004		29SS0060002		29SS0070002	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX				SO		SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SS		SS		SS		SS		SS		SS	
TOP DEPTH				0		0		0		0		0		0	
BOTTOM DEPTH				2		4		4		4		2		2	
MISCELLANEOUS PARAMETERS (%)															
PERCENT MOISTURE	NC	NC	NC	7.6		4.8		12		5.2		11		10	
PETROLEUM HYDROCARBONS (UG/KG)															
DRO (C08-C28)	230000	NC	230000	4000	U	12000	J	5700	J	14000	J	14000	J	4900	J
SEMIVOLATILES (UG/KG)															
ACENAPHTHENE	130000	29000	29000	18	U	36		19	U	25	J	19	UJ	11	J
ANTHRACENE	1700000	29000	29000	9.7	J	75		19	U	50		19	UJ	22	J
BENZO(A)ANTHRACENE	150	1100	150	67		**280**		35	J	120		51	J	56	J
BENZO(A)PYRENE	15	1100	15	**79**		**320**		**41**		**110**		**69**	**J**	**54**	**J**
BENZO(B)FLUORANTHENE	150	1100	150	140		**500**		82		**180**		**160**	**J**	87	J
BENZO(G,H,I)PERYLENE	170000	1100	1100	64		180		36	J	99		98	J	36	J
BENZO(K)FLUORANTHENE	1500	1100	1100	73		150		28	J	77		66	J	38	J
CARBAZOLE	5900	NC	5900	12	J	62	J	19	U	26	J	19	UJ	15	J
CHRYSENE	15000	1100	1100	84		320		46		130		79	J	67	J
DIBENZO(A,H)ANTHRACENE	15	1100	15	36	U	**52**	**J**	7.6	UJ	7	UJ	7.5	UJ	7.4	UJ
DIBENZOFURAN	4900	NC	4900	18	U	13	J	19	U	10	J	19	UJ	18	UJ
FLUORANTHENE	230000	29000	29000	110		540		56		190		59	J	120	J
FLUORENE	170000	29000	29000	18	U	22	J	19	U	21	J	19	UJ	8.1	J
INDENO(1,2,3-CD)PYRENE	150	1100	150	52		150		34	J	72		71	J	31	J
PHENANTHRENE	13000	29000	13000	59		390		24	J	230		37	J	100	J
PYRENE	340000	1100	1100	230		1100		110		460		170	J	200	J

Notes:

DRO = diesel range organics
DUP = duplicate
ERA = ecological risk assessment value
HHRA = human health risk assessment value
J = Value is estimated.
MIN = minimum detection limit value
NC = No criteria.
SO = soil
SS = surface sample
U = Analyte not detected at the reporting limit.
UJ = Numerical detection limit for the undetected result is estimated.
ug/kg = Microgram per kilogram.
Shaded cells and boldface font indicate that the concentration is greater than the minimum screening criterion.

TABLE 5-2

POSITIVE HITS FOR SURFACE SOIL
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

LOCATION	HHRA	ERA	MIN	29SB008		29SB009		29SB010				29SB011	
SAMPLE ID				29SS0080004		29SS0090004		29SS0100002		29SS0100002-D		29SS0110002	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		DUP		NORMAL	
MATRIX				SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SS		SS		SS		SS		SS	
TOP DEPTH				0		0		0		0		0	
BOTTOM DEPTH				4		4		2		2		2	
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC	NC	NC	5.4		6		4.2		16		5.1	
PETROLEUM HYDROCARBONS (UG/KG)													
DRO (C08-C28)	230000	NC	230000	3400	U	45000	J	3600	U	2600	U	3700	J
SEMIVOLATILES (UG/KG)													
ACENAPHTHENE	130000	29000	29000	35	J	18	UJ	17	UJ	20	U	7.3	J
ANTHRACENE	1700000	29000	29000	57	J	18	UJ	17	UJ	20	U	19	J
BENZO(A)ANTHRACENE	150	1100	150	140	J	31	J	11	J	20	U	63	J
BENZO(A)PYRENE	15	1100	15	**110**	**J**	**38**	**J**	7.3	J	8	UJ	**65**	**J**
BENZO(B)FLUORANTHENE	150	1100	150	**180**	**J**	70	J	15	J	20	U	130	J
BENZO(G,H,I)PERYLENE	170000	1100	1100	68	J	69	J	17	UJ	20	U	41	J
BENZO(K)FLUORANTHENE	1500	1100	1100	85	J	33	J	17	UJ	20	U	43	J
CARBAZOLE	5900	NC	5900	46	J	18	UJ	17	UJ	20	U	14	J
CHRYSENE	15000	1100	1100	130	J	54	J	8	J	20	U	81	J
DIBENZO(A,H)ANTHRACENE	15	1100	15	**24**	**J**	7.1	UJ	14	UJ	8	UJ	**24**	**J**
DIBENZOFURAN	4900	NC	4900	15	J	18	UJ	17	UJ	20	U	17	U
FLUORANTHENE	230000	29000	29000	270	J	30	J	20	J	20	U	130	
FLUORENE	170000	29000	29000	28	J	18	UJ	17	UJ	20	U	17	U
INDENO(1,2,3-CD)PYRENE	150	1100	150	52	J	40	J	35	UJ	40	U	36	J
PHENANTHRENE	13000	29000	13000	280	J	26	J	7.3	J	20	U	90	
PYRENE	340000	1100	1100	460	J	100	J	10	J	20	U	230	J

Notes:

DRO = diesel range organics
DUP = duplicate
ERA = ecological risk assessment value
HHRA = human health risk assessment value
J = Value is estimated.
MIN = minimum detection limit value
NC = No criteria.
SO = soil
SS = surface sample
U = Analyte not detected at the reporting limit.
UJ = Numerical detection limit for the undetected result is estimated.
ug/kg = Microgram per kilogram.
Shaded cells and boldface font indicate that the concentration is greater than the minimum screening criterio

TABLE 5-3

FREQUENCY OF DETECTION IN SUBSURFACE SOIL
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Result	Minimum Qualifier	Maximum Result	Maximum Qualifier	Screening Criteria (ug/kg)	Applicable Criteria	Location of Maximum Detection	Sample of Maximum Detection	Minimum Nondetect	Maximum Nondetect	Average of Positive Results	Overall Average	Standard Deviation
MISCELLANEOUS PARAMETERS (%)														
PERCENT MOISTURE	10/10	5.9		19		NA	NA	29SB006	29SB0060206			14.29	14.29	3.91
SEMIVOLATILES (UG/KG)														
2-METHYLNAPHTHALENE	1/10	8.7	J	8.7	J	3100	HH	29SB005	29SB0050406	18	21	8.7	9.67	0.54
ACENAPHTHENE	2/10	130		160		29000	Eco	29SB005	29SB0050406	18	21	145	36.8	57.46
ANTHRACENE	3/10	7.7	J	260		29000	Eco	29SB011	29SB0110203	18	21	175.9	59.62	105.61
BENZO(A)ANTHRACENE	4/10	26	J	640		150	HH	29SB011	29SB0110203	18	21	292.5	122.9	229.33
BENZO(A)PYRENE	4/10	22	J	540		15	HH	29SB011	29SB0110203	7.1	16	253.5	104.17	198.21
BENZO(B)FLUORANTHENE	4/10	28	J	690		150	HH	29SB011	29SB0110203	18	21	327.5	136.9	254.81
BENZO(G,H,I)PERYLENE	3/10	32	J	260		1100	Eco	29SB011	29SB0110203	18	21	147.33	51.05	85.46
BENZO(K)FLUORANTHENE	3/10	24	J	280		1100	Eco	29SB011	29SB0110203	18	21	188	63.25	109.16
CARBAZOLE	2/10	170	J	170	J	5900	HH	29SB005	29SB0050406	18	21	170	41.8	67.57
CHRYSENE	4/10	15	J	610		1100	Eco	29SB011	29SB0110203	18	21	288	121.1	225.80
DIBENZO(A,H)ANTHRACENE	3/10	13	J	86		15	HH	29SB005	29SB0050406	7.1	16	60	21.15	33.01
DIBENZOFURAN	2/10	38	J	84	J	4900	HH	29SB005	29SB0050406	18	21	61	20	24.18
FLUORANTHENE	4/10	49	J	1700		29000	Eco	29SB011	29SB0110203	18	21	812.25	330.8	647.10
FLUORENE	2/10	120		170		29000	Eco	29SB005	29SB0050406	18	21	145	36.8	58.23
INDENO(1,2,3-CD)PYRENE	3/10	21	J	240		150	HH	29SB011	29SB0110203	35	41	137	54.65	76.96
NAPHTHALENE	1/10	11	J	11	J	9.4	HH	29SB005	29SB0050406	7.1	20	11	6.04	2.90
PHENANTHRENE	4/10	21	J	1000		13000	HH	29SB011	29SB0110203	18	21	516.25	212.4	415.24
PYRENE	4/10	32	J	1000		1100	Eco	29SB011	29SB0110203	18	21	478.75	197.4	378.35
PETROLEUM HYDROCARBONS (UG/KG)														
DRO (C08-C28)	6/10	4700		310000	J	230000	HH	29SB005	29SB0050406	1500.00	3900	56116.67	34220	96922.29

Associated Samples:
29SB0010203
29SB0020406
29SB0030406
29SB0050406
29SB0060206
29SB0070204
29SB0080406
29SB0090406
29SB0100204
29SB0110203

Notes:

DRO = Diesel Range Organics
J = Value is estimated.
ug/kg = Microgram per kilogram.

TABLE 5-4

POSITIVE HITS IN SUBSURFACE SOIL
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

LOCATION	HHRA	29SB001		29SB002		29SB003		29SB005		29SB006			
SAMPLE ID		29SB0010203		29SB0020406		29SB0030406		29SB0050406		29SB0060206		29SB0060206-D	
SAMPLE DATE		20110713		20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		DUP	
MATRIX		SO		SO		SO		SO		SO		SO	
SAMPLE TYPE		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX		SB		SB		SB		SB		SB		SB	
TOP DEPTH		2		4		4		4		2		2	
BOTTOM DEPTH		3		6		6		6		6		6	
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC	13		16		12		13		19		18	
PETROLEUM HYDROCARBONS (µg/kg)													
DRO (C08-C28)	230000	2200	U	1500	U	4900		**310000**	**J**	3900	U	3300	U
SEMIVOLATILES (µg/kg)													
2-METHYLNAPHTHALENE	3100	19	U	20	U	19	UJ	8.7	J	21	U	20	U
ACENAPHTHENE	130000	19	U	20	U	19	UJ	160		21	U	20	U
ANTHRACENE	1700000	7.7	J	20	U	19	UJ	260		21	U	20	U
BENZO(A)ANTHRACENE	150	44		20	U	26	J	**460**		21	U	20	U
BENZO(A)PYRENE	15	**42**		7.9	UJ	**22**	**J**	**410**		8	UJ	8	UJ
BENZO(B)FLUORANTHENE	150	52		20	U	28	J	**540**		21	U	20	U
BENZO(G,H,I)PERYLENE	170000	32	J	20	U	19	UJ	150		21	U	20	U
BENZO(K)FLUORANTHENE	1500	24	J	20	U	19	UJ	260		21	U	20	U
CARBAZOLE	5900	19	U	20	U	19	UJ	170	J	21	U	20	U
CHRYSENE	15000	47		20	U	15	J	480		21	U	20	U
DIBENZO(A,H)ANTHRACENE	15	13	J	7.9	UJ	7.6	UJ	**86**		8	UJ	8	UJ
DIBENZOFURAN	4900	19	U	20	U	19	UJ	84	J	21	U	20	U
FLUORANTHENE	230000	100		20	U	49	J	1400		21	U	20	U
FLUORENE	170000	19	U	20	U	19	UJ	170		21	U	20	U
INDENO(1,2,3-CD)PYRENE	150	21	J	39	U	38	UJ	150		41	U	41	U
NAPHTHALENE	9.4	7.7	UJ	20	UJ	7.6	UJ	**11**	**J**	8	UJ	8	UJ
PHENANTHRENE	13000	44		20	U	21	J	1000		21	U	20	U
PYRENE	340000	63		20	U	32	J	820		21	U	20	U

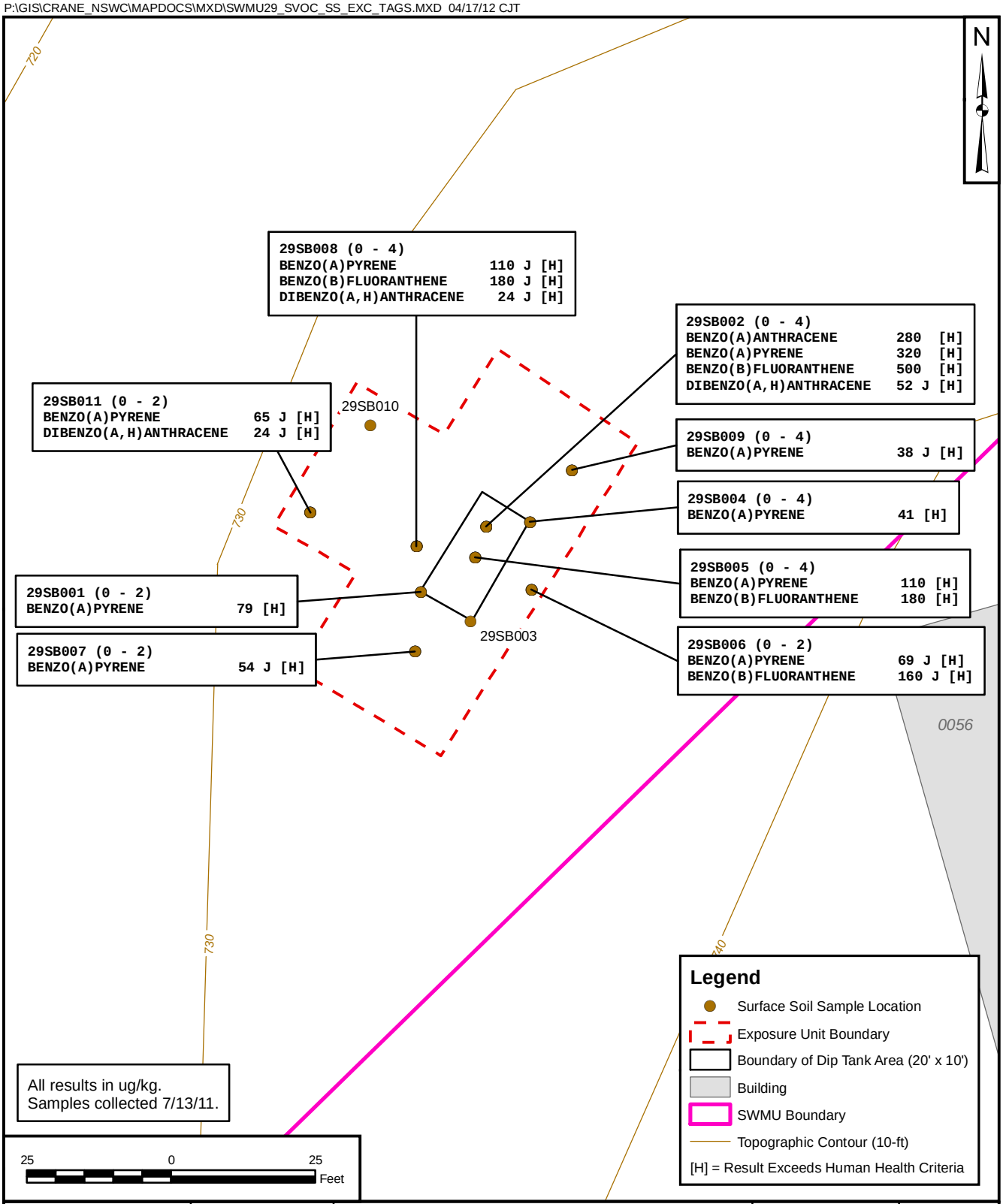
TABLE 5-4

POSITIVE HITS IN SUBSURFACE SOIL
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

LOCATION	HHRA	29SB007		29SB008		29SB009		29SB010		29SB011	
SAMPLE ID		29SB0070204		29SB0080406		29SB0090406		29SB0100204		29SB0110203	
SAMPLE DATE		20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX		SO		SO		SO		SO		SO	
SAMPLE TYPE		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX		SB		SB		SB		SB		SB	
TOP DEPTH		2		4		4		2		2	
BOTTOM DEPTH		4		6		6		4		3	
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC	12		5.9		17		18		17	
PETROLEUM HYDROCARBONS (µg/kg)											
DRO (C08-C28)	230000	5100		7200		4700		4800		3400	U
SEMIVOLATILES (µg/kg)											
2-METHYLNAPHTHALENE	3100	19	U	18	UJ	20	UJ	20	U	20	U
ACENAPHTHENE	130000	19	U	18	UJ	20	UJ	20	U	130	
ANTHRACENE	1700000	19	U	18	UJ	20	UJ	20	U	260	
BENZO(A)ANTHRACENE	150	19	U	18	UJ	20	UJ	20	U	**640**	
BENZO(A)PYRENE	15	8	UJ	7.1	UJ	16	UJ	8	UJ	**540**	
BENZO(B)FLUORANTHENE	150	19	U	18	UJ	20	UJ	20	U	**690**	
BENZO(G,H,I)PERYLENE	170000	19	U	18	UJ	20	UJ	20	U	260	
BENZO(K)FLUORANTHENE	1500	19	U	18	UJ	20	UJ	20	U	280	
CARBAZOLE	5900	19	U	18	UJ	20	UJ	20	U	170	J
CHRYSENE	15000	19	U	18	UJ	20	UJ	20	U	610	
DIBENZO(A,H)ANTHRACENE	15	8	UJ	7.1	UJ	16	UJ	8	UJ	**81**	
DIBENZOFURAN	4900	19	U	18	UJ	20	UJ	20	U	38	J
FLUORANTHENE	230000	19	U	18	UJ	20	UJ	20	U	1700	
FLUORENE	170000	19	U	18	UJ	20	UJ	20	U	120	
INDENO(1,2,3-CD)PYRENE	150	38	U	35	UJ	40	UJ	40	U	**240**	
NAPHTHALENE	9.4	8	UJ	7.1	UJ	16	UJ	8	UJ	16	UJ
PHENANTHRENE	13000	19	U	18	UJ	20	UJ	20	U	1000	
PYRENE	340000	19	U	18	UJ	20	UJ	20	U	1000	

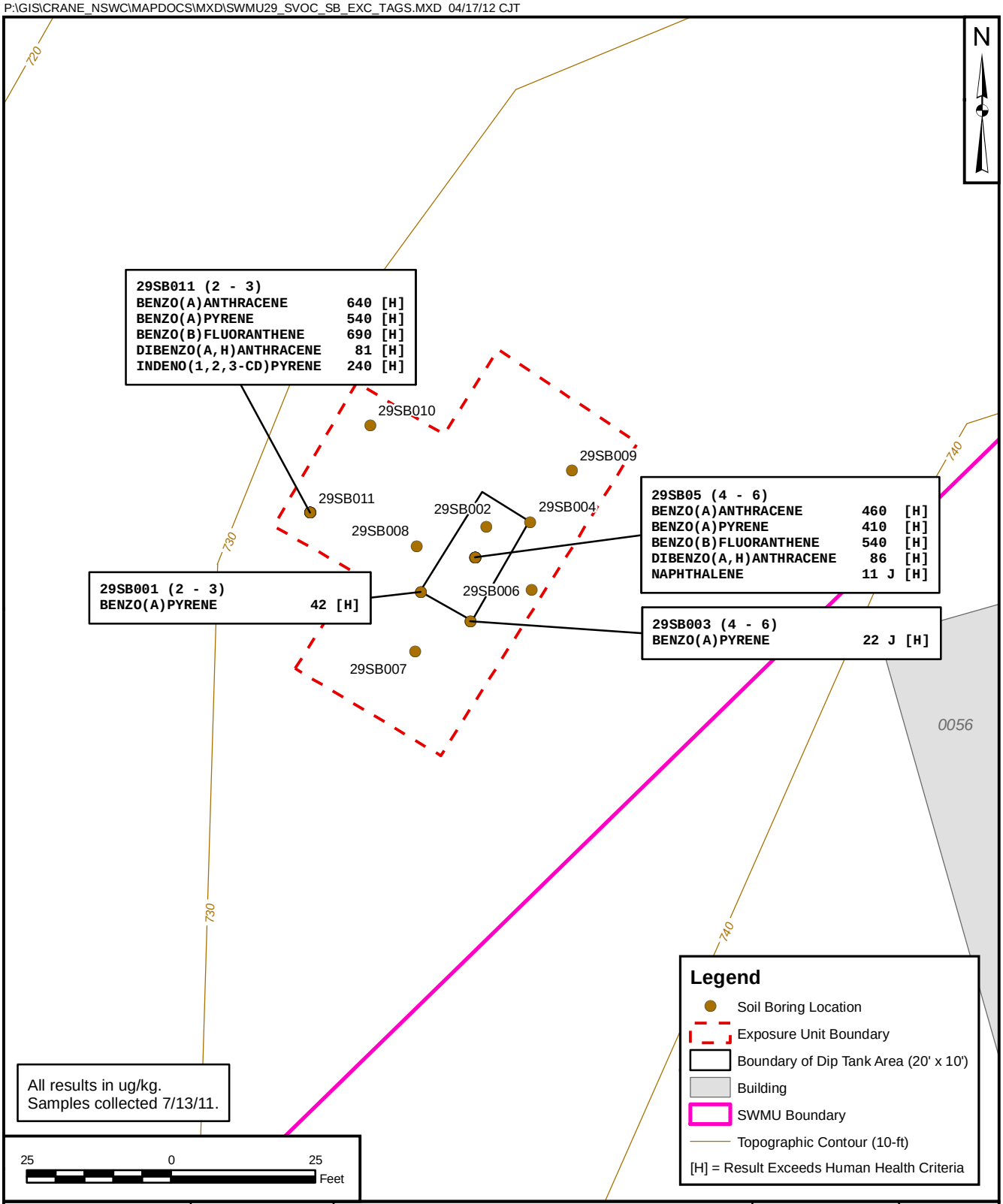
Notes:
DRO = diesel range organics
DUP = duplicate
HHRA = human health risk assessment value
J = Value is estimated.
NC = No criteria.
SB = subsurface sample
SO = soil
U = Analyte not detected at the reporting limit.
UJ = Numerical detection limit for the undetected result is estimated.
µg/kg = Microgram per kilogram.
Shaded cells indicate that the concentration is greater than the minimum screening criterion.

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU29_SVOC_SS_EXC_TAGS.MXD 04/17/12 CJT



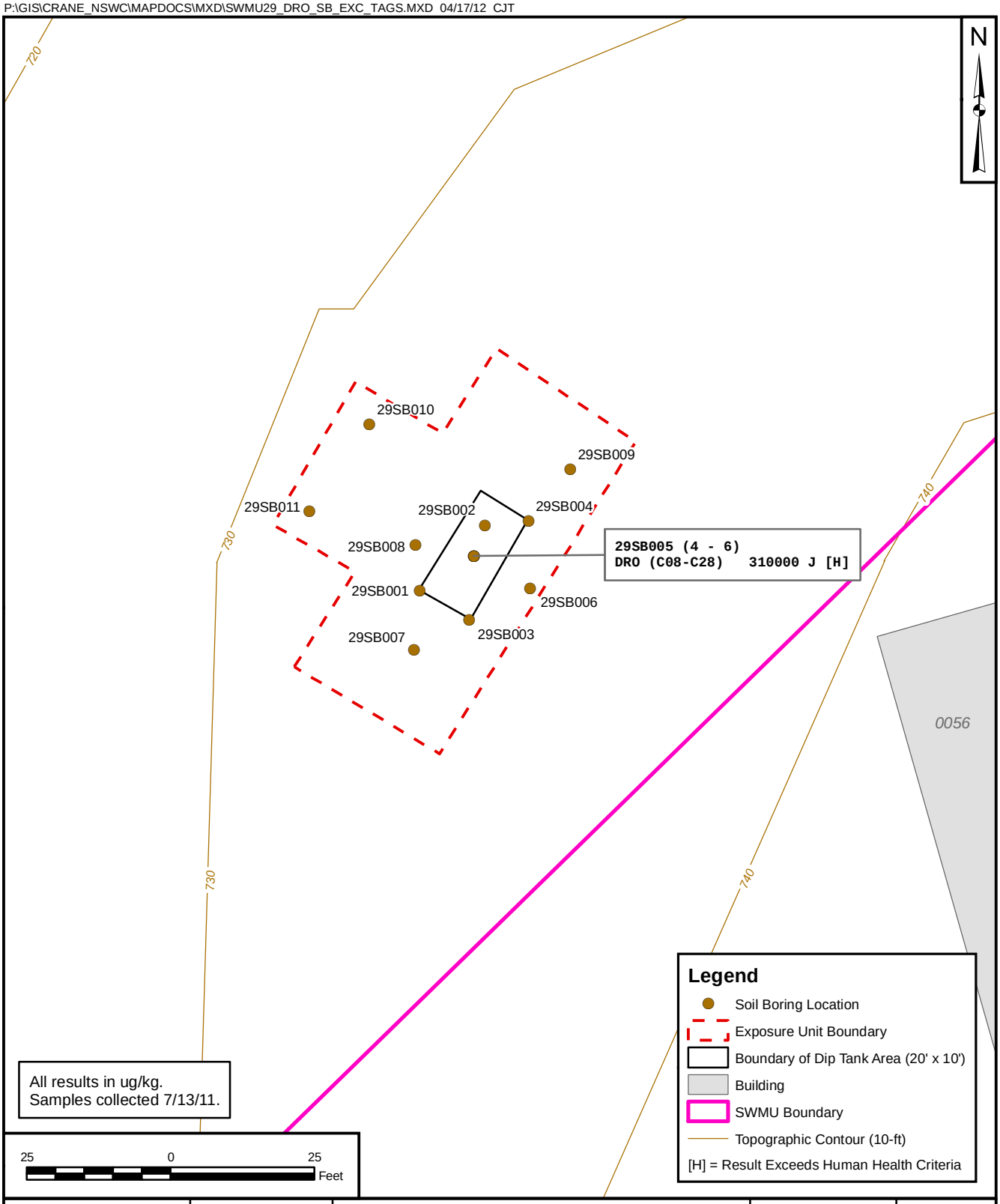
DRAWN BY: J. ENGLISH — DATE: 01/18/12		SVOCs EXCEEDING MINIMUM HUMAN HEALTH SCREENING VALUES IN SURFACE SOIL SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	CONTRACT NUMBER: 3137 — CTO NUMBER: F27N
CHECKED BY: E. BERKLITE — DATE: 01/18/12			APPROVED BY: E. BERKLITE — DATE: 01/19/12
REVISED BY: C. TULLEY — DATE: 04/17/12			APPROVED BY: ___ — DATE: ___
SCALE: AS NOTED	NAVFAC		FIGURE NO.: FIGURE 5-1 — REV: 0

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU29_SVOC_SB_EXC_TAGS.MXD 04/17/12 CJT



DRAWN BY: J. ENGLISH — DATE: 01/18/12	SVOCs EXCEEDING MINIMUM HUMAN HEALTH SCREENING VALUES IN SUBSURFACE SOIL SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	CONTRACT NUMBER: 3137	CTO NUMBER: F27N
CHECKED BY: E. BERKLITE — DATE: 01/19/12		APPROVED BY: E. BERKLITE	DATE: 01/19/12
REVISED BY: C. TULLEY — DATE: 04/17/12		APPROVED BY: ___	DATE: ___
SCALE: AS NOTED		FIGURE NO.: FIGURE 5-2	REV: 0

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU29_DRO_SB_EXC_TAGS.MXD 04/17/12 CJT



DRAWN BY: J. ENGLISH	DATE: 01/18/12	DROs EXCEEDING MINIMUM HUMAN HEALTH SCREENING VALUES IN SUBSURFACE SOIL SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	CONTRACT NUMBER: 3137 / CTO NUMBER: F27N
CHECKED BY: E. BERKLITE	DATE: 01/18/12		APPROVED BY: E. BERKLITE / DATE: 01/19/12
REVISED BY: C. TULLEY	DATE: 04/17/12		APPROVED BY: ___ / DATE: ___
SCALE: AS NOTED			FIGURE NO.: FIGURE 5-3 / REV: 0

6.0 CONCEPTUAL SITE MODEL, CONTAMINANT TRANSPORT, AND ATTENUATION

This section presents an overview of the movement of contaminants at SWMU 29 among the environmental media. The focus is placed on two major contaminant groups SVOCs (including PAHs) and DRO, which can be attributed to historical site operations or that have been detected in environmental media at SWMU 29. The information presented in this section is to be used to:

- Provide information on the chemical and physical properties, which affect the mobility, migration, biodegradation, and persistence of the principal chemicals of potential concern (COPCs) at SWMU 29.

- Assist in health and ecological risks presented in Sections 7.0 and 8.0, respectively.

- Assist in risk management decisions.

- Assess whether movement of contaminants among environmental media will result in significant future changes to exposure point concentrations to receptors or significant exposure to receptors not currently exposed or at locations not currently exposed.

- Assess whether the potential exists for contaminant concentrations to decrease over time in various media.

- Present a conceptual site model which identifies contamination sources, contaminant migration pathways, and potential receptors.

6.1 PROPERTIES AFFECTING MOBILITY, ATTENUATION, AND PERSISTENCE

COPCs present at SWMU 29 belong to two primary groups: SVOCs, of which the exceedances were all PAHs, and DRO. Section 6 concentrates on the COPCs that are considered to be the primary contaminants of concern. The primary chemical and biological factors which affect the mobility, migration, biodegradation, and persistence of these chemicals are solubility, adsorption/desorption, biodegradation, photolysis, and plant uptake. These processes and their effects on fate and transport will be discussed in this section.

6.1.1 Mobility

According to the Naval Assessment and Control of Installation Pollutants (NACIP) Study (NEESA, 1983), the groundwater at NSA Crane is divided into two regimes: one associated with soil/alluvial cover and the other associated with the bedrock. This study reports that shallow groundwater is generally transient occurring during high precipitation periods. Free water within alluvial deposits is likely to percolate into bedrock or be discharged into intermittent streams along alluvial - bedrock. Table 1 adapted from the NACIP study, is the general water bearing properties of the alluvial deposits and bedrock at NSA Crane.

The well developed drainage network and level of precipitation at NSA Crane promote the run-off of any pollutants deposited on the surface at the site. Numerous streams and fine grained alluvial material increase the erosional potential of areas in which wastes are disposed.

6.1.2 Solubilities and Adsorption/Desorption Properties

PAHs have very low solubilities, vapor pressures, and Henry's Law constants, and high K_{oc}s (Soil Organic carbon-water partition coefficient) and K_{ow}s (soil octanol-water partition coefficient). The soil organic carbon-water partitioning coefficient (K_{oc}s) is the ratio of the mass of a chemical that is adsorbed in the soil per unit mass of organic carbon in the soil per the equilibrium chemical concentration in solution. The octanol-water partition coefficient (K_{ow}s) is the ratio of the concentration of a chemical in octanol and in water at equilibrium and at a specified temperature. Octanol is an organic solvent that is used as a surrogate for natural organic matter. The low molecular weight PAHs (e.g., naphthalene) may volatilize from water, and the high molecular weight PAHs (e.g., benzo(a)pyrene, benzo(a)anthracene, etc.) are less likely to volatilize. PAHs in soil are much more likely to bind to the soil and be transported via mass transport mechanisms than go into solution or volatilize. PAHs are subject to degradation via aerobic bacteria, but may be relatively persistent in the absence of microbial populations or macronutrients such as phosphorus and nitrogen (ATSDR, 1995).

The solubilities and adsorption/desorption properties of DRO would be similar to the heavy end PAHs. Table 6-1 includes the Environmental Fate and Transport Parameters for Organic Chemicals.

6.1.3 Biodegradation

Land Spreading applications, in which solid waste is placed in thin layers onto the surface of the land or incorporated into the surface layers of the soil, have indicated that PAHs are highly amenable to microbial degradation in soil, with the rate of degradation influenced by temperature, pH, oxygen concentrations,

initial chemical concentrations, and moisture. Photolysis, hydrolysis, and oxidation are not relevant fate processes for the degradation of PAHs in soil (ATSDR, 1995).

PAHs are degraded in water by photo-oxidation, chemical oxidation, and biodegradation. PAHs do not contain functional groups that are susceptible to hydrolytic action, and hydrolysis is considered to be an insignificant degradation mechanism. The rate of photodegradation is influenced by water depth, turbidity, and temperature. Benzo(a)pyrene is reported to be resistant to photodegradation. PAHs may also be oxidized by chlorination and ozonation and may be metabolized by microbes under oxygenated conditions (ATSDR, 1995). This RFI investigated the soil and not groundwater. The site is steeply inclined and tributaries drain the site towards the northwest 800 feet from the shore of Lake Greenwood, thus interaction between the soil and surface water is expected. Groundwater was not encountered during boring advancement at the site and the depth to groundwater is not known at SWMU 29.

6.1.4 Plant Uptake

Bioconcentration of PAHs in aquatic organisms is greater for the higher molecular weight compounds than the lower molecular weight compounds. PAHs can bioaccumulate from in receptors from ingesting water, sediments, or lower organisms in the food chain.

6.2 CONCEPTUAL SITE MODEL AND MIGRATION OF CONTAMINANTS

Figure 6-1 presents a schematic diagram of pathways that contaminants may take as migration routes from the site. Table 2-2 presents an overall summary of chemical analyses performed on the samples collected from SWMU 29. Table 6-2 presents the COPC in Surface Soil: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene and Table 6-3 presents the COPC in Subsurface Soil: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, and DRO. These summaries are intended to present the overall picture of which chemicals are migrating, which ones are the most widespread, and which ones have the potential to migrate further.

6.2.1 Historical Operations and Releases

This unit was located near Building 56. It was used for dipping untreated wood into PCP solution (wood preservative). The PCP Dip Tank was located at SWMU 29 and operated between 1950 and 1965. NSA personnel reported that the dip tank leaked. However, there was no documentation available indicating the number of leaks, dates, and estimated quantities of PCP that may have leaked from the tank. The tank was removed in 1965. An IAS conducted in 1983 inspected the dip tank location and revealed there

is no vegetation stress or evidence to confirm the PCP leak (NEESA, 1983). . The IAS found no evidence of a leak and recommended no further action (NFA). In 1987, a Preliminary Review/Site Inspection was conducted and recommended that soil should be sampled in the location of the former tank to verify the conclusions of the IAS Study (A.T. Kearney, 1987). There are no groundwater monitoring wells at this SWMU.

There are significant information gaps regarding site-specific operations of the tank. For example, there is no documentation regarding the wood treating process, frequency of operation, PCP solution formulation, and reported leaks (location, date, duration, quantity of solution, etc.). The former PCP Dip Tank was supposedly used to treat wooden pallets. It is assumed that PCP solution was released to the environment via tank leaks and/or during process steps that may have allowed PCP solution to drip on to the adjacent soil during removal of the treated wood from the solution. If the leaks were large enough, it is possible that some of the PCP solution may have drained beyond the adjacent soil and down the slope located west of the tank.

A literature search was conducted to identify chemicals potentially associated with wood preservation operations, including impurities and degradation compounds. Technical grade PCP has been noted to contain small amounts of impurities such as tetrachlorophenol, trichlorophenols, dichlorophenols, polychlorodiphenyl ethers, polychlorophenoxy phenols, chlorinated hydrocarbons, polychlorinated dioxins and furans, and hexachlorobenzene as manufacturing by-products. In addition, oils (e.g., P-9 oil, kerosene, No. 2 fuel oil, or mineral spirits), which contain polycyclic aromatic hydrocarbons (PAHs) are commonly mixed with the technical-grade PCP to produce the dip tank solution.

The PCP degradation compounds identified are 2,3,5,6-tetrachlorohydroquinone, 2,3,6-trichlorohydroquinone, 2,4,6-Trichlorophenol, 2,6-Dichlorophenol, 2.6-Dichlorohydroquinone, 2-Chloromaleylacetate, Maleylacetate, and 3-Oxoadipate.

The only PCP degradation compounds which were analyzed were 2,4,6-Trichlorophenol and 2,6-Dichlorophenol because there are no PSL values for the other six compounds which the analytical results of these degradation products can be readily compared. Furthermore, the acetates and 3-oxoadipate are relatively soluble in water and hence they are relatively mobile and are expected to degrade more rapidly than the PCP and PCP impurities. This means the degradation products are less likely to be detectable than PCP and its impurities.

The UFP-SAP (Tetra Tech, 2011) indicated if PCP was detected in the samples, then the five samples with the greatest PCP concentrations would be submitted for dioxins/furans analyses. However, PCP

was not detected in any of the samples analyzed. Therefore as a result, dioxins or furans analyses were not conducted for any soil samples.

6.3 CONTAMINANT FATE AND TRANSPORT

This section focuses on some of the fate and transport issues associated with the major types of contaminants detected at SWMU 29.

6.3.1 Conceptual Physical Model and Hydrology

The soil characteristics at SWMU 29 are expected to be similar to those of SWMU 16 because both of these SWMUs are in the area of NSA Crane covered by residual soil derived from Pennsylvanian bedrock/colluvium (Tetra Tech, 2001). The Pennsylvanian bedrock underlying the soil overburden contains black shales, carbonaceous shales, and coal. Based on soil samples collected during the RI, the Pennsylvanian soils consist of clay, silt, sand, and fragmented and/or partially weathered bedrock. The overburden depth from the RI borings at SWMU 29 ranged from 2.7 to 6.5 feet deep. Measured soil pH values at SWMU 16, in Pennsylvania soils similar to SWMU 29, ranged from about 5 to 8, with most soil pH values in the 5.5 to 7.7 range. The soil pH values at SWMU 29 are expected to fall into the 5 to 8 range as well.

Releases of PCP and other treatment solution contaminants to the environment at SWMU 29, if they occurred, most likely occurred through leaks of the dip tank or spills during treatment operations when treatment solution may have dripped onto surface soil during removal of the treated wood. After release to surface soil, PCP can percolate vertically downward during precipitation events into subsurface soil and groundwater and possibly result in a complete exposure pathway to human receptors that could consume groundwater or soil or could make direct dermal contact with these media. PCP in surface soil could flow as overland runoff toward areas of lower elevation, especially within existing surface drainage channels. These channels could then transport the contaminants in surface water and sediment to lower elevations within the channels. PCP degrades readily in shallow surface water when exposed to light. So the persistence of PCP is expected to be short under those conditions. PCP impurities and degradation products would exhibit similar fates but dioxins and furans would be significantly more persistent.

PCP is generally considered to be mobile in the environment, but its mobility is highly dependent on pH, being least mobile under conditions of high pH and organic content. PCP is moderately persistent in soil,

with a reported field half-life of 45 days (Extoxnet, 2011). PCP sorption is expected to increase in soils with higher proportions of soil organic matter decreasing its mobility.

PCP degradation is considered to occur primarily by anaerobic biodegradation in flooded or anaerobic (airless) soils, at higher temperatures, and in the presence of organic matter in the soil. Decomposition products produced during this process include acetates, polychlorinated phenols, hydroquinones, and 3-oxoadipate (Tetra Tech, 2011).

6.3.2 Semi-Volatile Organic Compounds

6.3.2.1 PAHs

PAHs are generally considered to be fairly immobile in the environment; they are large molecules with high K_{oc}s and low solubilities when compared to VOCs. These compounds generally do not migrate vertically through soil to a great extent. Instead, they are more likely to adhere to soil particles and be transported with the soil particles via surface runoff and erosional processes.

SWMU 29 is characterized by well-developed dendritic surface drainage. Surface water generally flows toward Lake Greenwood in the northwest.

6.4 SUMMARY OF CONCEPTUAL SITE MODEL

Human receptors at SWMU 29 include people who currently, or could in the future, interact with contaminated media. Current site users include NSA Crane industrial or construction workers and trespassers. The area is rural, and there are no residential areas within a mile of the site. However, because future land use is unknown, it is customary to evaluate the future use of the property as residential. Therefore, potential future receptors at SWMU 29 include hypothetical future residents and persons recreating at the site. Human receptors may be exposed to different media based on their specific activities. These media include surface and subsurface soil.

Ecological receptors include invertebrates and plant species that could be affected by the contaminants that are present at the site. At SWMU 29, ecological receptors can be exposed only to surface soil media. Exposure of ecological receptors to groundwater and subsurface soil is not anticipated; however, contamination in subsurface soil or groundwater may serve as sources of contamination to sediment or surface water through subsurface transport or diffuse flow to streams. Terrestrial plants, invertebrates, and vertebrates are exposed to surface soil by direct contact and ingestion of soil and other food items.

Figure 6-1 is a schematic diagram of the conceptual flow and transport model for SWMU 29. Conclusions regarding release potential to soil have been developed based on analytical results from the RFI. Nine of ten surface soil sampling locations and four of ten subsurface soil sampling locations exceeded the Minimum Regulatory Screening Values for particular SVOCs. DRO was detected in 7 of 10 surface soil samples, 6 of 10 surface soil samples, and was exceeded in one subsurface soil sampling location.

Groundwater and surface water were not investigated. However, conclusions regarding release potential to groundwater and surface water and associated environmental pathways have been developed based on background information and field observations gathered during the RFI. Figure 6-1 summarizes the following:

- The source area is defined as the former PCP Dip Tank. This was removed and is not an ongoing source.
- The source media are the soil and surface water (groundwater was not addressed in the RFI).
- The release mechanisms are plant/animal uptake, runoff/erosion, leaching, and infiltration.
- The exposure media are the food chain, surface water, groundwater, surface soil, and subsurface soil.
- The exposure routes are vegetation, domestic animals, game/fish/prey, ingestion, dermal contact, and inhalation.
- Receptors are Current site users include NSA Crane industrial or construction workers and trespassers, and biota.

SWMU 29 operated a PCP wood preservation chemical dip tank. The following is a summary of the conceptualized aspects of contaminant migration, fate, and persistence at SWMU 29:

- SVOCs and DRO were released to surface and subsurface soils.
- SVOCs and DRO could have leached through the soil and may have potentially impacted groundwater. Groundwater was not addressed during this RFI.

- SVOCs and DRO could have migrated via overland flow and potentially may have impacted surface water. Surface water was not addressed during this RFI.

- Nearly all of the groundwater in the uppermost bedrock (i.e., the Raccoon Creek Group) is flowing laterally away from toward the upper slopes of the ridge. Some of this groundwater may seep into the gullies and streams at the bottom of the slope and some of the potentially contaminated groundwater may be taken up by trees and other vegetation and transpired. Thus, natural phytoremediation may be playing a part in controlling and reducing the rate of contaminants reaching the base of the ridge and entering the tributary stream.

- Groundwater resources at NSA have not been studied extensively because the facility utilities surface waters from Lake Greenwood for human consumption, process operations, and recreation. However, the existing lithologies, occurrences of springs and seeps, and the well developed surface drainage indicate the existence of groundwater that is hydraulically connected to the surface environment.

- The potential for release to soil/groundwater from this unit is unknown. The NACIP study (NEESA, 1983) reports no indication of release from the unit. This conclusion was not supported by field or laboratory data.

- The potential for release to surface water from this unit is unknown. The location of SWMU 29 overlooks a steep slope which slopes toward Lake Greenwood.

- The potential for past release to air from SWMU 29 is unknown due to lack of information on the former PCP Dip Tank. The tank has been removed and there is no present potential for air release.

- The PCP Dip Tank no longer exists in the area, so the high potential of risk does not exist. Soil sampling and analytical results do not show a significant threat to human health or the environment.

TABLE 6-1

ENVIRONMENTAL FATE AND TRANSPORT PARAMETERS FOR ORGANIC CHEMICALS
SWMU 29 - PCP DIP TANK
NSA CRANE
CRANE, INDIANA

Chemical	Density (g/cm^3)[1]	Vapor Pressure (mm Hg)[2]	Solubility (mg/L)[2]	Log of Octanol/Water Partition Coefficient (K_{ow})[2]	Organic Carbon Partition Coefficient (K_{OC})[2]	Henry's Law Constant ($atm\text{-}m^3/mole$)[2]	Bioconcentration Factor (L/kg)[3]	Mobility Index log((solubility*VP)/Koc)
SEMIVOLATILES								
BENZO(A)ANTHRACENE	1.274[5]	0.00000021	0.0094	5.76	176900	0.000012	NA	-1.40E+01
BENZO(A)PYRENE	1.351[5]	0.00000000549	0.00162	6.11	587400	0.000000457	2.90E+05	-1.68E+01
BENZO(B)FLUORANTHENE	NA	0.0000005	0.0015	6.11	599400	0.000000657	NA	-1.49E+01
DIBENZO(A,H)ANTHRACENE	NA	0.000000000955	0.00249	6.7	1912000	0.000000141	NA	-1.79E+01
INDENO(1,2,3-CD)PYRENE	NA	0.000000000125	0.00019	6.7[5]	1951000	0.000000348	NA	-1.99E+01
NAPHTHALENE	1.0253	0.085	31	3.17	1544	0.00044	1.30E+04	-2.77E+00
DIESEL RANGE ORGANICS	0.85	0.4	Negligible	1	NA	NA	NA	NA

NA - Not available.

[1] The CRC Handbook of Chemistry and Physics, 89th or 91st Edition

[2] EPI (Estimation Programs Interface) Suite™ is a Windows-based suite of physical/chemical property and environmental fate estimation programs delveloped by the EPA's Office of

[3] Superfund Chemical Data Matrix, 2004, Food Chain Fresh

[4] Values are referenced from Endosulfan

[5] Pennsylvania Land Recycling Program Chemical and Physical Properties Database
http://www.depreportingsvcs.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/CPP/Chemicals

TABLE 6-2

CHEMICALS OF CONCERN IN SURFACE SOIL
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	HHRA	ERA	MIN	29SS0010002		29SS0020004		29SS0040004		29SS0050004		29SS0060002		29SS0070002		29SS0080004		29SS0090004		29SS0100002		29SS0100002-D		29SS0110002	
SEMIVOLATILES (UG/KG)																									
BENZO(A)ANTHRACENE	150	1100	150	67		**280**		35	J	120		51	J	56	J	140	J	31	J	11	J	20	U	63	J
BENZO(A)PYRENE	15	1100	15	**79**		**320**		**41**		**110**		**69**	**J**	**54**	**J**	**110**	**J**	**38**	**J**	7.3	J	8	UJ	**65**	**J**
BENZO(B)FLUORANTHENE	150	1100	150	140		**500**		82		**180**		**160**	**J**	87	J	**180**	**J**	70	J	15	J	20	U	130	J
DIBENZO(A,H)ANTHRACENE	15	1100	15	36	U	**52**	**J**	7.6	UJ	7	UJ	7.5	UJ	7.4	UJ	**24**	**J**	7.1	UJ	14	UJ	8	UJ	**24**	**J**

Notes:

J = Value is estimated.
MIN = minimum detection limit value
U = Analyte not detected at the reporting limit.
UJ = Numerical detection limit for the undetected result is estimated.
ug/kg = Microgram per kilogram.
ERA = ecological risk assessment value
HHRA = human health risk assessment value
Shaded cells indicate that the concentration is greater than the minimum screening criterion.

TABLE 6-3

CHEMICALS OF CONCERN IN SUBSURFACE SOIL
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

SAMPLE ID	**29SB0010203**		**29SB0030406**		**29SB0050406**		**29SB0110203**	
PETROLEUM HYDROCARBONS (UG/KG)								
DRO (C08-C28)	2200	U	4900		**310000**	**J**	3400	U
SEMIVOLATILES (UG/KG)								
BENZO(A)ANTHRACENE	44		26	J	**460**		**640**	
BENZO(A)PYRENE	**42**		**22**	**J**	**410**		**540**	
BENZO(B)FLUORANTHENE	52		28	J	**540**		**690**	
DIBENZO(A,H)ANTHRACENE	13	J	7.6	UJ	**86**		**81**	
INDENO(1,2,3-CD)PYRENE	21	J	38	UJ	150		**240**	
NAPHTHALENE	7.7	UJ	7.6	UJ	**11**	**J**	16	UJ

Notes:

DUP = duplicate
J = Value is estimated.
SB = subsurface sample
U = Analyte not detected at the reporting limit.
UJ = Numerical detection limit for the undetected result is estimated.
ug/kg = Microgram per kilogram.
Shaded cells and boldface font indicate that the concentr

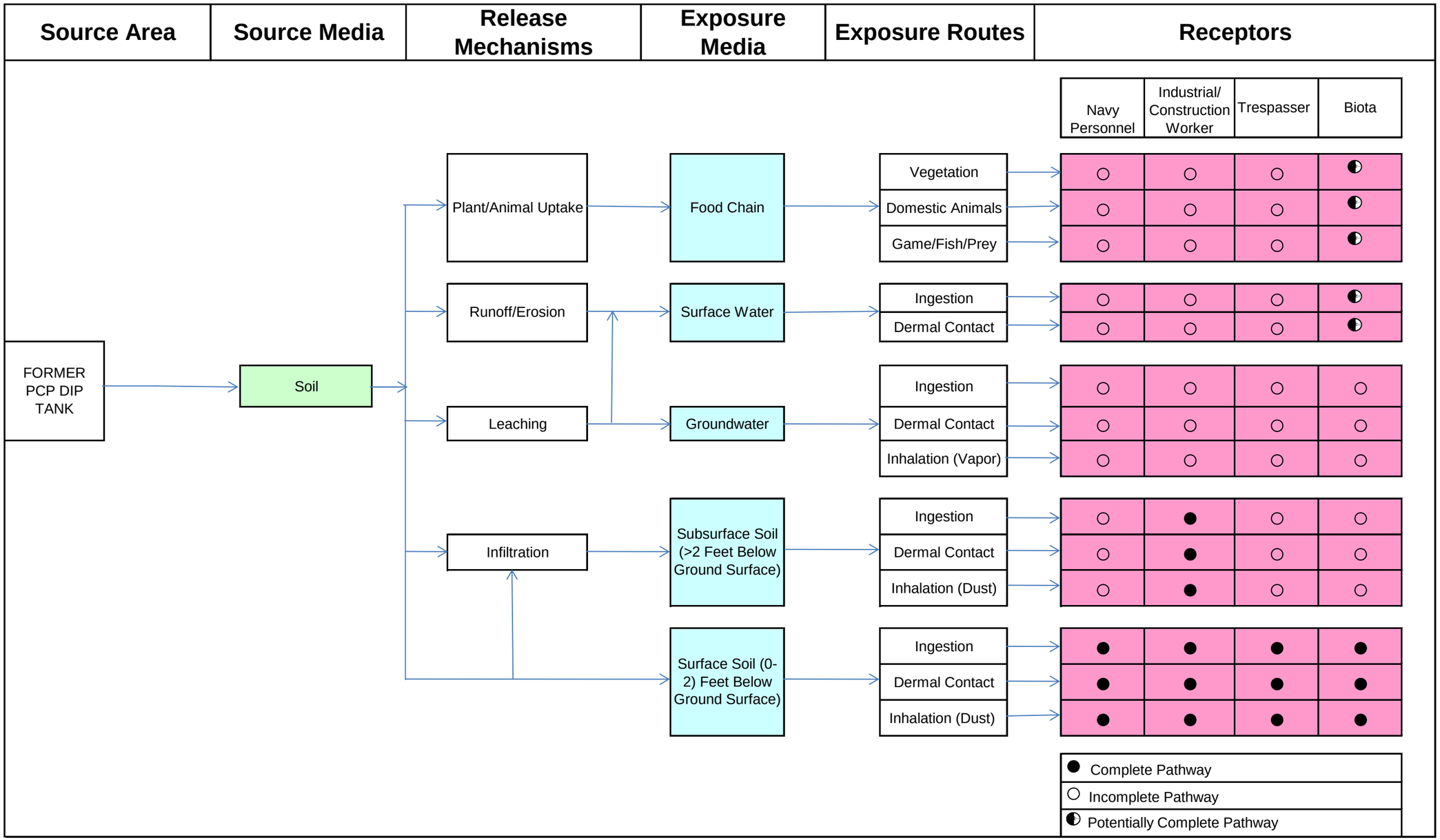
FIGURE 6-1

EXPOSURE PATHWAY ANALYSIS

SWMU 29 - PCP DIP TANK

NSA CRANE

CRANE, INDIANA



7.0 HUMAN HEALTH RISK ASSESSMENT

This section presents the HHRA for the PCP Dip Tank, Building 56 Area (SWMU 29) at NSA Crane. The objective of the HHRA is to determine whether detected concentrations of chemicals within the study area pose a significant threat to potential human receptors under current and/or future land use. The potential risks to human receptors were estimated based on the assumption that no actions were taken to control contaminant releases.

The following current USEPA and IDEM guidance documents were used to develop the framework for the baseline HHRA:

- Conducting Human Health Risk Assessments Under the Environmental Restoration Program (Navy, 2001).
- U.S. Navy Human Health Risk Assessment Guidance (Navy, 2008)
- Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A) (USEPA, 1989).
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (USEPA, 1991).
- Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure (USEPA, 1993b).
- Exposure Factors Handbook. (USEPA, 1997c).
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002b).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) (USEPA, 2004).
- Guidelines for Carcinogen Risk Assessment (USEPA, 2005b).

- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005c).

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (USEPA, 2009).

- Risk Integrated System of Closure. User's Guide and Technical Resource Guidance Document (IDEM, 2009).

The HHRA is structured and reported according to the guidelines of the Risk Assessment Guidance for Superfund (RAGS), Human Health Evaluation Manual, Part D: Standardized Planning, Reporting, and Review of Superfund Risk Assessments (RAGS Part D) (USEPA, 2001).

A HHRA consists of five components: data evaluation, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. Sections 7.1 through 7.5 contains detailed discussions of the five components of the HHRA.

Three major aspects of chemical contamination and environmental fate and transport must be considered to evaluate potential risks: (1) contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or by human action; (2) potential exposure points must exist; and (3) human receptors must be present at the point of exposure. Risk is a function of both toxicity and exposure. If any one of these factors is absent for a site, the exposure pathway is incomplete, and no potential risks are considered to exist for human receptors.

7.1 DATA EVALUATION

Data evaluation, the first component of a baseline HHRA, is a medium-specific task involving the compilation and evaluation of analytical data. The main objective of the data evaluation is to develop a medium-specific list of chemicals of potential concern (COPCs) that will be used to quantitatively determine potential human health risks for site media.

Samples collected during the 2011 investigation were used in this HHRA. Only PAHs and DRO were detected in the surface soil and subsurface soil samples collected at SWMU 29. The maximum of the original and duplicate sample was used in the selection of COPCs. Samples used in this HHRA are listed on the COPC selection tables and in Appendix E.1. Nature and extent of contamination is discussed in Section 5.0.

7.1.1 Derivation of Screening Criteria

The primary criteria used to identify COPCs are based on USEPA Regional Screening Levels (RSLs) (2011) and IDEM Risk Integrated System Closure (RISC) default closure levels (2009). The RSLs were developed and are maintained through a cooperative agreement between Oak Ridge National Laboratory (ORNL) and USEPA's Office of Superfund, and are considered to be USEPA screening criteria. The RSLs are based on exposure pathways for which generally accepted methods, models, and assumptions have been developed (i.e., ingestion, dermal contact, and inhalation) for specific land-use conditions and do not consider ecological receptors. The screening concentrations based on the RSLs correspond to a systemic hazard quotient (HQ) of 0.1 for non-carcinogens or an incremental lifetime cancer risk (ILCR) of 1×10^{-6} for carcinogens. The RSLs for non-carcinogens are based on an HQ of 1, whereas the screening concentrations used in the selection of COPCs were based on an HQ of 0.1 to account for the potential cumulative effects of several chemicals affecting the same target organ or producing the same adverse non-carcinogenic effect.

The IDEM default closure levels for soil are based on the lower of the risk based direct contact criteria, the soil attenuation capacity values, the soil saturation concentrations, and the migration from soil to groundwater criteria (IDEM, 2009). The IDEM risk based default closure levels for direct contact correspond to a systemic HQ of 1 (for noncarcinogens) or an ILCR of 1×10^{-5} (for carcinogens).

Screening concentrations based on the following criteria were used to select COPCs for surface and subsurface soil:

- USEPA RSLs for Residential Soil (USEPA, 2011).
- IDEM residential default closure levels for direct contact (IDEM, 2009)

Maximum chemical concentrations in soil were also compared to USEPA risk-based SSLs for groundwater protection and to IDEM default closure levels for transfers from soil to groundwater. The SSLs for migration from soil to groundwater and the IDEM default closure levels were not used for the selection of COPCs for direct contact exposure; however, they do allow qualitative evaluation of the potential for chemical migration from soil to groundwater. Chemicals with concentrations exceeding the SSLs/IDEM default closure levels may potentially migrate from soil to groundwater in sufficient quantities to pose groundwater quality problems.

The risk-based screening levels used in the COPC selection for soil are presented in Table 7-1.

Background Evaluation

No base- or site-specific background data was available for PAHs and DRO, consequently a background evaluation was not performed.

7.1.2 Decision Rules for Establishing COPCs

The following decision rule was used to select initial lists of COPCs for SWMU 29:

- A chemical detected in soil was selected as a COPC for soil if any detected chemical concentration exceeded the screening levels for soil.

7.1.3 COPCs Selected for HHRA

COPCs were selected for surface soil and subsurface soil using the risk-based COPC screening levels described in Section 7.1.1. A discussion of the chemicals identified as COPCs and the rationale for COPC selection is provided in the following subsections. A discussion of the nature and extent of the chemicals detected in site media is presented in Section 4.0 and is not repeated in this section. COPC selection information for each medium is presented in Tables 7-2 through 7-5. Chemicals retained as COPCs are presented in Table 7-6. RAGS Part D tables for COPC selection are included in Appendix E.2.

7.1.3.1 Surface Soil

A comparison of maximum detected surface soil concentrations to screening levels based on RSLs for residential exposures and IDEM residential default closure levels for direct contact is presented in Table 7-2. The following chemicals were detected at maximum concentrations exceeding direct contact COPC screening levels and were retained as COPCs for surface soil at SWMU 29:

- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene].

Concentrations of all chemicals were less than the IDEM residential default closure levels for direct contact with soil.

A comparison of maximum detected surface soil concentrations to USEPA SSLs for chemical migration from soil to groundwater and IDEM residential default closure levels for migration to groundwater is

presented in Table 7-3. The following chemicals were detected in surface soil at maximum concentrations exceeding the screening levels for migration from soil to groundwater and were retained as COPCs for surface soil at SWMU 29:

- PAHs [benzo(a)anthracene and benzo(a)pyrene]

Concentrations of all chemicals were less than the IDEM residential default closure levels for migration from surface soil to groundwater. Benzo(a)anthracene only exceeded the SSLs in one sample (29SS0020004).

7.1.3.2 Subsurface Soil

A comparison of maximum detected surface soil concentrations to screening levels based on RSLs for residential exposures and IDEM residential default closure levels for direct contact is presented in Table 7-4. The following chemicals were detected at maximum concentrations exceeding direct contact COPC screening levels and were retained as COPCs for subsurface soil at SWMU 29:

- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene].

Benzo(a)pyrene in one sample (29SB0110203) was the only chemical detected at concentrations exceeding the IDEM residential default closure levels for direct contact with soil.

A comparison of maximum detected subsurface soil concentrations to USEPA SSLs for chemical migration from soil to groundwater and IDEM residential default closure levels for migration to groundwater is presented in Table 7-5. The following chemicals were detected in subsurface soil at maximum concentrations exceeding the screening levels for migration from soil to groundwater and were retained as COPCs for subsurface soil at SWMU 29:

- PAHs [benzo(a)anthracene, benzo(a)pyrene, and naphthalene]
- DRO

DRO in one sample (29SB0050406) was the only chemical detected at concentrations exceeding the IDEM residential default closure levels for migration from soil to groundwater. PAHs only exceeded the SSLs in two samples (29SB0050406 and 29SB0110203).

7.1.3.3 Summary

Table 7-6 summarizes the chemicals retained as COPCs for surface soil and subsurface soil at the SWMU 29. RAGS Part D tables for COPC selection are included in Appendix E.2.

7.2 EXPOSURE ASSESSMENT

This portion of the risk assessment defines and evaluates, quantitatively or qualitatively, the type and magnitude of human exposure to the chemicals present at or migrating from a site. The exposure assessment is designed to depict the physical setting of the site, to identify potentially exposed populations and applicable exposure pathways, to calculate concentrations of COPCs to which receptors might be exposed, and to estimate chemical intakes under the identified exposure scenarios.

Actual or potential exposures at SWMU 29 were determined based on the most likely pathways of contaminant release and transport, as well as human activity patterns. A complete exposure pathway has three components: a source of chemicals that can be released to the environment, a route of contaminant transport through an environmental medium, and an exposure or contact point for a human receptor.

7.2.1 Conceptual Site Model

A conceptual site model (CSM) facilitates consistent and comprehensive evaluation of potential risks to human health by creating a framework for identifying the pathways by which human receptors may come in contact with environmental media contaminated by site activities. A CSM depicts the relationships among the following elements, which are necessary for defining complete exposure pathways:

- Site sources of contamination
- Contaminant release mechanisms and transport/migration pathways
- Exposure routes
- Potential receptors

The elements of the CSM (contaminant source, release mechanisms, transport/migration pathways, exposure routes, and potential receptors) establish the manner and degree to which a potential receptor may be exposed to chemicals present at the site. The degree of risk incurred by a potential receptor varies according to the means of exposure, the duration of exposure, and the specific chemical to which the receptor is exposed.

Section 6.0 presents a discussion of the site location, sources of contamination, contaminant release mechanisms, and transport and migration pathways for SWMU 29. Table 7-7 provides a site-specific summary of the potential receptors evaluated for SWMU 29. A summary of the exposure routes addressed quantitatively for each human receptor is provided in Table 7-8. Figure 7-1 illustrates the CSM for SWMU 29.

Potential Current and Future Receptors of Concern and Exposure Pathways

NSA Crane is an active naval base and will remain active for the foreseeable future. Current site receptors include industrial or construction workers, and adolescent trespasses. However, for purposes of completeness, the baseline risk assessment will consider receptor exposure under residential, industrial, and recreational land use scenarios. Based on current and potential future land use, the following potential receptors may be exposed to contaminated environmental media within the study area:

- **Construction Workers** – A plausible receptor under current or future land use. No construction activities are currently planned for the study area. However, this receptor could be exposed to surface and subsurface soils (incidental ingestion; dermal contact), and air (inhalation) if excavation activities were to occur in the future.

- **Industrial Worker** – A plausible receptor under current and future land use. This includes adult military or civilian personnel assigned to routine daily work tasks in the SWMU 29 area. This receptor could be exposed to surface soil (incidental ingestion; dermal contact) and air (inhalation). Industrial worker exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions.

- **Recreational Users** – A plausible receptor under future land use. If NSA Crane were to close, the most likely scenario is that the property would be converted to a recreational park. A recreational user may be exposed to potentially contaminated surface soil (incidental ingestion; dermal contact), and air (inhalation). Recreational exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions. NSA Crane is not expected to close in the foreseeable future.

- **On-Base Residents** – Given the anticipated future land use for much of SWMU 29 (commercial/industrial), residents are a very unlikely future receptor. However, the hypothetical future

residential scenario is typically evaluated in a risk assessment for decision-making purposes. For example, the need for deed restrictions at a site may be eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that a hypothetical resident may be exposed to surface soil (ingestion; dermal contact; inhalation). Receptor exposure to subsurface soil would only occur if subsurface soil was excavated and deposited on existing surface soil. Although this is an unlikely scenario, it is included in this HHRA for purposes of completeness and to assist the risk managers regarding the need for deed restrictions.

7.2.2 Central Tendency Exposure versus Reasonable Maximum Exposure

Traditionally, exposures evaluated in the HHRA were based on the concept of a reasonable maximum exposure (RME) only, which is defined as "the maximum exposure that is reasonably expected to occur at a site" (USEPA, 1989). However, subsequent risk assessment guidance (USEPA, 1992) indicates the need to address an average case or central tendency exposure (CTE).

To provide a full characterization of potential exposure, both RME and CTE scenarios were evaluated in the HHRA for SWMU 29. The available guidance (USEPA, 1993b) concerning the evaluation of CTE is limited. Therefore, professional judgment was exercised when defining CTE conditions for a particular receptor at a site.

7.2.3 Exposure Point Concentrations

The exposure point concentration (EPC), which is calculated for COPCs only, is an estimate of the chemical concentration within an exposure unit (EU). The EPC is assumed to be the concentration to which the receptor is exposed and is used to estimate exposure intakes. An EU is the area over which receptor activity is expected to occur.

The following guidelines were used to calculate EPCs:

- For surface soil and subsurface soil, the 95-percent upper confidence limit (UCL) on the arithmetic mean, which was based on the distribution of the data set, was selected as the EPC. EPCs were calculated following USEPA's Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002) and using USEPA's ProUCL software Version 4.1.00 (USEPA, 2010).

- Non-detected values were evaluated in accordance with the ProUCL guidance. Duplicates were averaged for purposes of calculating EPCs for COPCs in environmental media. In calculating the averages, if one sample was detected and the other was non-detected then the average was calculated using the detected value and one half the non-detected value.

Table 7-9 summarizes the EPCs used in this HHRA. ProUCL Outputs are included in Appendix E.3. RAGS Part D Tables for the EPCs are presented in Appendix E.2.

7.2.4 Chemical Intake Estimation

The methodologies and techniques used to estimate exposure intakes are presented in this section. Intakes for the identified potential receptor groups were calculated using the current USEPA risk assessment guidance cited in Section 7.0 and are presented in the risk assessment spreadsheets. Risk assessment results are presented using USEPA RAGS Part D table format. Assumptions regarding exposure are presented in Tables 7-10 and 7-11 for the RME and CTE scenarios, respectively. The exposure assumptions presented in Tables 7-10 and 7-11 are based on current USEPA and IDEM risk assessment guidance.

Non-carcinogenic intakes were estimated using the concept of an average annual exposure. Carcinogenic intakes were calculated as incremental lifetime exposures, which assume a life expectancy of 70 years. The exposure assumptions reflect current USEPA guidance. The majority of the exposure assumptions used to estimate chemical intakes were based on default assumptions described in several USEPA guidance documents (e.g., USEPA, 1989, 1991, 1997c, and 2004) and IDEM guidance (IDEM, 2009). The following paragraphs discuss the non-default receptor-specific exposure assumptions used in the risk assessment.

7.2.4.1 Incidental Ingestion of Soil

Direct physical contact with soil may result in the incidental ingestion of chemicals. Chemical intake for the incidental ingestion of soil is estimated in the following manner (USEPA, 1989):

$$\text{Intake} = \frac{(C_s)(IR)(FI)(EF)(ED)(CF)}{(BW)(AT)}$$

where:

Intake	=	intake of chemical from soil (mg/kg/day)
C_s	=	concentration of chemical in soil (mg/kg)
IR	=	ingestion rate (mg/day)
FI	=	fraction ingested from contaminated source (dimensionless)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
CF	=	conversion factor (1×10^{-6} kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for non-carcinogens, AT = ED x 365 days/yr
		for carcinogens, AT = 70 yr x 365 days/yr

Most of the exposure assumptions used to estimate chemical intakes from incidental ingestion of soil were based on default assumptions described in standard USEPA guidance and are summarized in Tables 7-10 and 7-11. The following paragraphs briefly discuss the non-default receptor-specific exposure assumptions for incidental ingestion of soil that were used in the HHRA.

The selected exposure frequency assumptions consider anticipated receptor activities at SWMU 29. It is assumed that construction workers assigned to future excavation projects at SWMU 29 are exposed to soil for 5 days a week over 30 weeks (150 days a year) for 1 year under the RME scenario. The exposure frequency for the CTE scenario was assumed to be 50 percent of the RME or 75 days a year. Child and adult recreational users are assumed to be exposed to soil two days a week during the summer months (52 days a year) under the RME scenario and one day a week (26 days a year) under the CTE scenario.

7.2.4.2 Dermal Contact with Soil

Direct physical contact with soil may result in the dermal absorption of chemicals. Exposure associated with dermal contact with soil is estimated in the following manner (USEPA, 1989):

$$\text{Intake} = \frac{(C_s)(SA)(AF)(ABS)(CF)(EF)(ED)}{(BW)(AT)}$$

where:

Intake	=	amount of chemical absorbed during contact with soil (mg/kg/day)
C_s	=	concentration of chemical in soil (mg/kg)
SA	=	skin surface area available for contact (cm^2/day)
AF	=	skin adherence factor (mg/cm^2)
ABS	=	absorption factor (dimensionless)
CF	=	conversion factor (1×10^{-6} kg/mg)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for non-carcinogens, AT = ED x 365 days/year
		for carcinogens, AT = 70 years x 365 days/year

Most of the exposure assumptions used to estimate chemical intakes from dermal contact with soil were based on the default assumptions described in standard USEPA guidance and are summarized in Tables 7-10 and 7-11. The following paragraphs briefly discuss non-default receptor-specific exposure assumptions for dermal contact with soil that were used in the HHRA.

The exposed skin surface areas of the body available for dermal contact with soil were determined on a receptor-specific basis because they correspond with assumed human activities and clothing worn during exposure events. With the exception of the skin surface area recommended for child and adult recreational users, all of the skin surface areas presented in Tables 7-10 and 7-11 are based on USEPA default values. Current guidance (USEPA, 1997 and 2004) was used to develop the skin surface area available for contact for the child and adult recreational users as follows:

- For adult recreational users assumed to be exposed to soil, the exposed surface area available for contact was the sum of the head, arms, hands, lower legs, and feet of an adult male. This skin surface area is 9,070 cm^2 for the RME and CTE scenarios. This value represents the 50^{th}-percentile areas for the arms, hands, lower legs, and feet (USEPA, 1997). For a small child recreational user (0 to 6 years old), it was assumed that 50 percent of the body surface area was exposed to surface soil (i.e., 3,300 cm^2). This value represents the 50^{th}-percentile areas presented in Table 4-6 of the Exposure Factors Handbook (USEPA, 1997).

The same exposure frequencies and durations recommended for the evaluation of incidental ingestion of soil were used to estimate chemical intakes for dermal contact with soil. The soil adherence factors

presented are those in Exhibits 3.3 and 3.5 of RAGS Part E. A value of 0.13 was used as the chemical-specific dermal absorption factors PAHs.

7.2.4.3 Inhalation of Air Containing Fugitive Dust/Volatiles Emitted from Soil

Intakes of both particulates and vapors/gases are calculated using the same equation, as follows (USEPA, 2009):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{AT \times 24\ hrs/day}$$

where:

EC	=	exposure concentration (mg/m^3)
C_{air}	=	concentration of chemical in air (mg/m^3)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
AT	=	averaging time (hours);
	=	for non-carcinogens, AT = ED x 365 days/yr
	=	for carcinogens, AT = 70 yr x 365 days/yr

Some of the exposure assumptions used to estimate chemical intakes from inhalation of fugitive dusts/volatile emissions from surface and subsurface soil were based on default assumptions described in standard USEPA guidance and are summarized in Tables 7-10 and 7-11. The same exposure frequencies and durations used to estimate incidental ingestion of soil intakes were used to estimate exposure via inhalation of fugitive dust/volatile emissions for surface and subsurface soil.

The concentrations of chemicals in air resulting from emissions from soil are developed following procedures presented in USEPA Soil Screening Guidance (USEPA, 2002). Chemical concentrations in air were calculated as follows:

$$C_{air} = C_{soil} \times \left[\frac{1}{PEF} + \frac{1}{VF}\right]$$

where:

C_{air} = chemical concentration in air (mg/m^3)
C_s = chemical concentration in soil (mg/kg)
PEF = particulate emission factor (m^3/kg)
VF = volatilization factor (m^3/kg)

No volatile chemicals were retained as COPCs in surface and subsurface soil; therefore, the above equation reduces to:

$$C_{air} = C_{soil} \times \left[\frac{1}{PEF} \right]$$

The particulate emissions factor (PEF) relates the concentration of the chemical in soil to the concentration of dust particles in air. A PEF value of $1.316 \times 10^{+9}$ was used for the HHRA of SWMU 29 soils (USEPA, 2002; IDEM, 2009). Because air emissions resulting from fugitive dust emissions settings will be different than dust emissions generated during construction activities, a separate PEF was used for construction activities. The PEF for construction workers ($1.34 \times 10^{+6}$ m^3/kg) was calculated using the equations presented in the supplemental SSL guidance document (USEPA, 2002). A sample calculation showing how the PEF for construction workers was calculated is presented in Appendix E.4.

7.2.4.4 Assessing Cancer Risks from Early Life Exposures

USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005) recommends making adjustments to the toxicity of carcinogenic chemicals that act via the mutagenic mode of action when evaluating early-life exposures. The guidance recommends using age-dependent adjustment factors (ADAFs) combined with age-specific exposure estimates when assessing cancer risks. In the absence of chemical-specific data, the supplement guidance recommends the following default adjustments, which reflect the fact that cancer risks are generally higher from early-life exposures than from similar exposures later in life:

- For exposures before 2 years of age (i.e., spanning a 2-year interval from the first day of birth until a child's second birthday), a 10-fold adjustment.

- For exposures between 2 and 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday until their sixteenth birthday), a three-fold adjustment.

- For exposures after turning 16 years of age, no adjustment.

The adjustments were applied using the same method as that used by ORNL in the development of RSLs. Children were evaluated as two age groups, ages 0 to 2 years and ages 2 to 6 years, and adults were evaluated as two age groups, ages 6 to 16, and ages greater than 16 years old. Using this approach, the intakes for child and adult recreational users and hypothetical residents were calculated as follows:

$$Intake_{Child} = Intake_{(ages\ 0 - 2\ years)} \times 10 + Intake_{(ages\ 2 - 6\ years)} \times 3$$

$$Intake_{Adult} = Intake_{(ages\ 6 - 16\ years)} \times 3 + Intake_{(ages > 16\ years)}$$

The above approach was used only for those chemicals that are identified as mutagenic in the ORNL screening table. Sample calculations showing how this approach was applied are included in Appendix E.4.

7.2.4.5 Summary of Exposure Parameters

A summary of exposure input parameters for all exposure pathways is presented in Tables 7-10 and 7-11 for the identified potential receptor groups at the Site. In general, standard default parameters (e.g., USEPA, 1989, 1991, 1997c, and 2004), which combine mid-range and upper-end exposure factors, were used to assess RME conditions in this HHRA. CTE conditions were assessed primarily by the use of mid-range exposure factors presented in current risk assessment guidance (USEPA, 1989 and 1993b).

7.3 TOXICITY ASSESSMENT

The toxicity assessment weighs the evidence regarding the potential for exposure to chemicals to produce adverse effects in exposed receptors and, when possible, the assessment estimates the relationship between the exposure to a chemical and the increased likelihood and/or severity of adverse effects. Quantitative estimates of the relationship between the magnitude and type of exposures and the severity or probability of human health effects are defined for the identified constituents of concern. Quantitative toxicity values determined during this component of the risk assessment are integrated with exposure assessment outputs to characterize the potential occurrence of adverse health effects for each receptor group.

The reference dose (RfD) is the toxicity value used to evaluate noncarcinogenic health effects for ingestion and dermal exposures. The reference concentration (RfC) is used to evaluate noncarcinogenic health effects for inhalation exposures. The RfD and RfC estimate a daily exposure level for a human population that is unlikely to pose an appreciable risk during a portion, or for all, of a human lifetime. It is based on a review of animal and/or human toxicity data, with adjustments for various data uncertainties. Carcinogenic effects are quantified using the cancer slope factor (CSF) for ingestion and dermal exposures, and using inhalation unit risks (IUR) for inhalation exposure that are plausible upper-bound estimates of the probability of the development of cancer per unit intake of the chemical over a lifetime. These are typically based on dose-response data from human and/or animal studies.

7.3.1 Toxicity Criteria for Oral and Inhalation Exposures

Oral RfDs and CSFs and inhalation RfCs and IURs used in this HHRA were obtained from the following primary USEPA literature sources (USEPA, 2003b):

- Tier 1 - Integrated Risk Information System (IRIS).

- Tier 2 - USEPA Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment (NCEA) Superfund Health Risk Technical Support Center develops PPRTVs on a chemical-specific basis when requested by USEPA's Superfund program.

- Tier 3 - Other Toxicity Values – These sources include but are not limited to California Environmental Protection Agency (Cal EPA) toxicity values, Agency for Toxic Substances and Disease Registry (ATSDR) values, and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b).

Although toxicity criteria can be found in several toxicological sources, USEPA's IRIS online database is the preferred source of toxicity values. This database is continuously updated, and the presented values have been verified by USEPA. The toxicity criteria for the constituents selected as COPCs are presented in Tables 7-12 through 7-15.

7.3.2 Toxicity Criteria for Dermal Exposure

RfDs and CSFs in the scientific literature are typically expressed as "administered" (i.e., not absorbed) doses. Therefore, these values are considered inappropriate for estimating risks associated with dermal exposures. Oral dose response parameters based on administered doses must be adjusted to absorbed doses before they can be compared to estimated dermal exposure intakes.

When oral absorption is essentially complete (i.e., 100 percent), an absorbed dose is equivalent to the administered dose and no toxicity adjustment is necessary. Conversely, when the gastrointestinal absorption of a chemical is poor (e.g., 1 percent), the absorbed dose is smaller than the administered dose; thus, toxicity factors based on an absorbed dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose. USEPA (USEPA, 2004) recommends a 50 percent absorption cut-off to reflect the intrinsic variability in analyzing absorption studies. Therefore, the adjustment from administered to absorbed dose was only performed when the chemical specific gastrointestinal absorption efficiency was less than 50 percent. The adjustment from administered to absorbed dose was made using chemical specific gastrointestinal absorption efficiencies published in numerous sources of guidance (e.g., USEPA 2004 [the primary reference], IRIS, ATSDR toxicological profiles, etc.), using the following equations:

$$RfD_{dermal} = (RfD_{oral})(ABS_{GI})$$

$$CSF_{dermal} = (CSF_{oral}) \; / \; (ABS_{GI})$$

where:
- ABS_{GI} = absorption efficiency in the gastrointestinal tract
- RfD_{dermal} = RfD for the dermal route of exposure
- RfD_{oral} = RfD for the oral route of exposure
- CSF_{dermal} = CSF for the dermal route of exposure
- CSF_{oral} = CSF of the oral route of exposure

As noted above, the preceding adjustment of the oral toxicity criteria (e.g., RfDs, CSFs) was necessary to allow quantitative evaluation of the dermal route of exposure in the baseline risk assessment. An explanation of this procedure and the need for this procedure are presented in Appendix A of USEPA RAGS Part A.

7.3.3 Mutagenic Chemicals

USEPA's Guidelines for Carcinogen Risk Assessment (USEPA, 2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. Carcinogenic PAHs are included in the group of chemicals that have been determined to act via the mutagenic mode of action. No chemical-specific ADAFs have been derived for carcinogenic PAHs; therefore, the following default ADAFs were used: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70. The ADAFs were used in evaluating exposures to carcinogenic PAHs for recreational users and hypothetical residents using the approach presented in Section 7.2.4.4.

7.4 RISK CHARACTERIZATION

This section provides a characterization of human health risks associated with potential exposures to COPCs at the Site. Potential risks (non-carcinogenic and carcinogenic) for human receptors resulting from exposures outlined in the exposure assessment were quantitatively determined and are discussed in this section. Sections 7.4.1 and 7.4.2 outline the methods used to quantitatively estimate the type and magnitude of potential risks for human receptors. Summaries of the risk characterization for SWMU 29 are provided in Section 7.4.3.

7.4.1 Quantitative Analysis

Quantitative estimates of risk for chemicals were calculated according to risk assessment methods outlined in USEPA guidance (USEPA, 1989). Lifetime cancer risks are expressed in the form of dimensionless probabilities, referred to as ILCRs, based on CSFs and IURs. Non-carcinogenic risk estimates are presented in the form of HQs that are determined through a comparison of intakes with published RfDs and RfCs.

ILCR estimates for ingestion and dermal exposures were generated for each COPC using estimated exposure intakes and published CSFs, as follows:

$$\text{ILCR} = (\text{Estimated Exposure Intake})(\text{CSF})$$

ILCR estimates for inhalation exposures were generated for each COPC using estimated exposure concentrations and published IURs, as follows:

$$\text{ILCR} = (\text{IUR})(\text{Exposure Concentration})(1000\ \mu\text{g/mg})$$

An ILCR of 1 x 10^{-6} indicates that the exposed receptor has an one-in-one-million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million people.

Non-carcinogenic risks were assessed using the concept of HQs and HIs. The HQ for a COPC is the ratio of the estimated intake to the RfD and is calculated for ingestion and dermal exposures as follows:

HQ = (Estimated Exposure Intake)/(RfD)

For inhalation exposures, HQ is calculated as follows:

HQ = (Exposure Concentration)/(RfC)

An HI was generated by summing the individual HQs for all COPCs. The HI is not a mathematical prediction of the severity of toxic effects; therefore, is not a true "risk"; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects.

7.4.1.1 Comparison of Quantitative Risk Estimates to Benchmarks

To interpret the quantitative risks and to aid risk managers in determining the need for remediation at a site, quantitative risk estimates were compared to typical risk benchmarks. Calculated ILCRs were interpreted using the USEPA's "target range" ($1x10^{-6}$ to $1x10^{-4}$).

USEPA has defined the range of $1x10^{-6}$ to $1x10^{-4}$ as the ILCR "target risk range" for most hazardous waste facilities addressed under CERCLA and RCRA. IDEM has defined this same risk range for the nondefault evaluation under their RISC program. Individual or cumulative ILCRs greater than $1x10^{-4}$ will typically not be considered as protective of human health and ILCRs less than $1x10^{-6}$ will typically be regarded as protective. Risk management decisions are necessary when the ILCR is within the $1x10^{-4}$ to $1x10^{-6}$ cancer risk range.

An HI exceeding unity (1) indicates that there may be potential noncarcinogenic health risks associated with exposure. If an HI exceeds unity, a segregation of target organ effects associated with exposure to COPCs is typically performed. Only those chemicals that affect the same target organ(s) or exhibit similar critical effect(s) are regarded as truly additive. Consequently, it may be possible for a cumulative HI to

exceed 1, but no adverse health effects are anticipated if the COPCs do not affect the same target organ or exhibit the same critical effect.

7.4.2 Results of the Risk Characterization

This section contains a summary of the results of the risk characterization for SWMU 29. Quantitative risk estimates for potential human receptors are developed for chemicals detected in soils. Uncertainties associated with the risk estimates are discussed in Section 7.5. The methodology used to calculate the risks presented in this section is provided in Sections 7.2 and 7.3. Potential cancer risks and hazard indices (HIs) were calculated for current/future construction workers, industrial workers, and future child recreational users, adult recreational users, and hypothetical residents under the RME and CTE scenarios and are summarized in Tables 7-16 and 7-17. Sample calculations are presented in Appendix E.4, and the results of the risk assessment in RAGS Part D format are included in Appendix E.2.

7.4.2.1 Noncarcinogenic Risks

No noncarcinogenic toxicity criteria are available for the identified COPCs; therefore, noncarcinogenic risks could not be estimated.

7.4.2.2 Carcinogenic Risks

Tables 7-16 and 7-17 and Figures 7-2 and 7-3 present the ILCRs for the RME and CTE scenarios at SWMU 29. ILCRs for all receptors exposed to surface soil and subsurface soil under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

7.5 UNCERTAINTY ANALYSIS

There is uncertainty associated with all aspects of the baseline human health risk assessment. A summary of the uncertainties, including a discussion of how they may affect the final risk numbers, is provided in this section.

Uncertainty in the selection of COPCs is related to the current status of the predictive databases, the grouping of samples, the numbers, types, and distributions of samples, and the procedures used to include or exclude constituents as COPCs. Uncertainty associated with the exposure assessment includes the values used as input variables for a given intake route or scenario, the assumptions made to determine EPCs, and the predictions regarding future land use and population characteristics. Uncertainty in the toxicity assessment includes the quality of the existing toxicity data needed to support

dose-response relationships and the weight-of-evidence used to determine the carcinogenicity of COPCs. Uncertainty in risk characterization includes that associated with exposure to multiple chemicals and the cumulative uncertainty from combining conservative assumptions made in earlier steps of the risk assessment process.

Whereas there are various sources of uncertainty, the direction of uncertainty can be influenced by the assumptions made throughout the risk assessment, including selection of COPCs and selection of values for dose-response relationships. Throughout the entire risk assessment, assumptions are biased toward a margin of safety so that the final calculated risks are overestimated.

Generally, risk assessments carry two types of uncertainty: measurement and informational. Measurement uncertainty refers to the usual variance that accompanies scientific measurements. For example, this type of uncertainty is associated with analytical data collected for each site. The risk assessment reflects the accumulated variances of the individual values used.

Informational uncertainty stems from inadequate availability of information needed to complete the toxicity and exposure assessments. Often, this gap is significant, such as the absence of information on the effects of human exposure to low doses of a chemical, on the biological mechanism of action of a chemical, or the behavior of a chemical in soil.

Once the risk assessment is complete, the results must be reviewed and evaluated to identify the type and magnitude of uncertainty involved. Reliance on results from a risk assessment without consideration of uncertainties, limitations, and assumptions inherent in the process can be misleading. For example, to account for uncertainties in the development of exposure assumptions, conservative estimates must be made to ensure that the particular assumptions made are protective of sensitive subpopulations or the maximum exposed individuals. If a number of conservative assumptions are combined in an exposure model, the resulting calculations can propagate the uncertainties associated with those assumptions, thereby producing a much larger uncertainty for the final results. This uncertainty is biased toward over predicting both carcinogenic and noncarcinogenic risks. Thus, both the results of the risk assessment and the uncertainties associated with those results must be considered when making risk management decisions.

This interpretation is especially relevant when the risks exceed the point of departure for defining "acceptable" risk. For example, when risks calculated using a high degree of uncertainty are less than an acceptable risk level (i.e., $1x10^{-6}$ to $1x10^{-4}$), the interpretation of no significant risk is typically

straightforward. However, when risks calculated using a high degree of uncertainty exceed an acceptable risk level (i.e., $1x10^{-4}$); a conclusion can be difficult unless uncertainty is considered.

7.5.1 Uncertainty in Data Evaluation

The most significant issue related to uncertainty in the data evaluation is the usability of the existing database. A brief discussion of the uncertainty in the data evaluation is provided in the remainder of this section.

Usability of Existing Databases

All the data used in the HHRA were validated. The qualification of data during the formal data validation process is not expected to compromise the results of the baseline HHRA. Analytical data qualified as estimated were utilized, even though the reported positive concentrations or sample-specific quantitation limits may be somewhat imprecise. The use of estimated data adds to the uncertainty associated with the risk assessment; however, the associated uncertainty is expected to be negligible compared to the other uncertainties inherent in the risk evaluation process (i.e., uncertainties with land uses, exposure scenarios, toxicological criteria, etc.). Because all data have been validated, the uncertainty in the calculated risks associated with the data is minimal.

Uncertainty Associated with Elevated Pentachlorophenol Detection Limits

Pentachlorophenol was not detected in any surface soil or subsurface soil sample collected at SWMU 29. Detection limits for pentachlorophenol ranged from 87 µg/kg to 200 µg/kg. The detection limits are lower than the USEPA residential RSL of 890 µg/kg and IDEM residential soil direct level of 20,000 µg/kg. The detection limits are higher than the USEPA risk-based protection of groundwater SSL of 34 µg/kg and IDEM migration to groundwater level of 28 µg/kg. The detection limits for pentachlorophenol do not introduce any uncertainty in the estimated risks since they are significantly lower than the USEPA and IDEM direct contact criteria for residential exposures. The detection limits do introduce some uncertainty into the evaluation of the potential for pentachlorophenol to migrate from soil to groundwater since they are higher than the USEPA and IDEM migration criteria. Although the uncertainty is not expected to be significant since detection limits exceed the migration criteria by less than an order of magnitude.

7.5.2 Uncertainty in the Exposure Assessment

Uncertainty in the exposure assessment arises because of the methods used to calculate EPCs, the determination of land use conditions, the selection of receptors and scenarios, the estimation of EPCs, and the selection of exposure parameters. Each of these is discussed below.

Land Use

The current land use patterns at NSA Crane are well established, thereby limiting the uncertainty associated with land use assumptions. Land use at SWMU 29 is currently limited and expected to be limited in the future, as long as NSA Crane remains open (industrial workers and construction workers are the only current and likely future receptors). To be conservative, risks to potential and future recreational users, and hypothetical residents were estimated for the site.

Exposure Point Concentrations

Uncertainty is associated with the use of the 95 percent UCL on the mean concentration as the EPC. As a result of using the 95 percent UCL, the estimations of potential risk for the RME scenario are most likely overstated since this is a representation of the upper limit that potential receptors would be exposed to over the entire exposure period.

Exposure Routes and Receptor Identification

The determination of various receptor groups and exposure routes of potential concern was based on current land use observed at the site and the anticipated future land use. Therefore, the uncertainty associated with the selection of exposure routes and potential receptors is minimal because they are considered to be well defined.

Exposure Parameters

Each exposure factor (for RME and CTE scenarios) selected for use in the risk assessment has some associated uncertainty. Generally, exposure factors are based on surveys of physiological parameters and lifestyle profiles across the United States. The attributes and activities studied in these surveys generally have a broad distribution. To avoid underestimation of exposure, in most cases, the USEPA guidelines (USEPA, 1991 and 1993b) on the RME receptor were used, which generally specify the use of the 95th percentile for most parameters. Therefore, the selected values for the RME receptor represent the upper bound of the observed or expected habits of the majority of the population.

Generally, the uncertainty can be assessed quantitatively for many assumptions made in determining factors for calculating exposures and intakes. Many of these parameters were determined from statistical analyses on human population characteristics. Often, the database used to summarize a particular exposure parameter (e.g., body weight) is quite large. Consequently, the values chosen for such variables in the RME scenario have low uncertainty.

Many of the exposure parameters used to calculate exposures and risks in this report are selected from a distribution of possible values, including USEPA guidance (USEPA, 1991 and 1993b) and dermal guidance (USEPA, 1997c and 2004). For the RME scenario, the value representing the 95th percentile is generally selected for each parameter to ensure that the assessment bounds the actual risks from a postulated exposure. This risk number is used in risk management decisions but does not indicate what a more average or typical exposure might be or what risk range might be expected for individuals in the exposed population.

To address these issues, USEPA (USEPA, 1992) has suggested the use of the CTE receptor, whose intake variables are often set at approximately the 50th percentile of the distribution. The risks for this receptor seek to incorporate the range of uncertainty associated with various intake assumptions. Some of the parameters presented in this risk assessment were estimated using professional judgment, although USEPA does provide limited guidance for the CTE evaluation (USEPA, 1993b).

7.5.3 Uncertainty in the Toxicological Evaluation

Uncertainty associated with the toxicity assessment is associated with hazard assessment and dose-response evaluations for the COPCs. The hazard assessment deals with characterizing the nature and strength of the evidence of causation or the likelihood that a chemical that induces adverse effects in animals will also induce adverse effects in humans. Hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination, using the USEPA methods. Positive animal cancer test data suggest that humans contain tissue(s) that may manifest a carcinogenic response; however, the animal data cannot necessarily be used to predict the target tissue in humans.

Uncertainty in hazard assessment arises from the nature and quality of the animal and human data. Uncertainty is reduced when similar effects are observed across species, strain, sex, and exposure route; when the magnitude of the response is clearly dose related; when pharmacokinetic data indicate a similar fate in humans and animals; when postulated mechanisms of toxicity are similar for humans and animals;

and when the COC is structurally similar to other chemicals for which the toxicity is more completely characterized.

Uncertainty in the dose-response evaluation includes the determination of a CSF for the carcinogenic assessment. Uncertainty is introduced from interspecies (animal to human) extrapolation, which, in the absence of quantitative pharmacokinetic or mechanistic data, is usually based on consideration of interspecies differences in basal metabolic rate. Uncertainty also results from intraspecies variation. Most toxicity experiments are performed with animals very similar in age and genotype, so intragroup biological variation is minimal, but the human population of concern may reflect a great deal of heterogeneity, including unusual sensitivity or tolerance to the COPC. Even toxicity data from human occupational exposure reflect a bias because only those individuals sufficiently healthy to attend work regularly (the "healthy worker effect") and those not unusually sensitive to the chemical are likely to be occupationally exposed. Finally, uncertainty arises from the quality of the key study from which the quantitative estimate is derived and the database. For cancer effects, the uncertainty associated with dose-response factors is mitigated by assuming the 95 percent upper bound for the slope factor. Another source of uncertainty in carcinogenic assessment is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linearized multistage model, which is used in nearly all quantitative estimations of human risk from animal data, is based on a nonthreshold assumption of carcinogenesis. However, evidence suggests that epigenetic carcinogens, as well as many genotoxic carcinogens, have a threshold below which they are noncarcinogenic. Therefore, the use of the linearized multistage model is conservative for chemicals that exhibit a threshold for carcinogenicity.

7.5.4 Uncertainty in the Risk Characterization

Uncertainty in risk characterization resulted from assumptions made regarding additivity of effects from exposure to multiple COPCs from various exposure routes. High uncertainty exists when summing noncancer risks for several substances across different exposure pathways. This assumes that each substance has a similar effect and/or mode of action. Even when compounds affect the same target organs, they may have different mechanisms of action or differ in their fate in the body, so additivity may not have been an appropriate assumption. However, the assumption of additivity was considered acceptable because in most cases it represented a conservative estimate of risk.

Risks to any individual may also have been overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may have been exposed via all pathways considered.

Also, the risk characterization did not consider antagonistic or synergistic effects. Little or no information was available to determine the potential for antagonism or synergism for the COPCs. Because chemical-specific interactions could not be predicted, the likelihood for risks to be over predicted or under predicted could not be defined, but the methodology used was based on current USEPA guidance.

7.6 SUMMARY AND CONCLUSIONS

This section summarizes the results of the baseline HHRA for the SWMU 29, which was performed to characterize the potential risks to likely human receptors under current and potential future land use. Potential receptors under current land use are industrial workers, construction works, and trespassers. Potential receptors under future land use are child and adult recreational users, and hypothetical child and adult residents. Although future land use is likely to be the same as current land use, the potential future receptors were evaluated in the baseline HHRA, primarily for decision-making purposes.

The COPCs for direct contact to soil:

- Surface soil – Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene.

- Subsurface Soil – Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

The COPCs for chemical migration from soil to groundwater:

- Surface soil – benzo(a)anthracene and benzo(a)pyrene.
- Subsurface Soil – benzo(a)anthracene, benzo(a)pyrene, naphthalene, and DRO.

Concentrations of all chemicals were less than the IDEM migration to groundwater criteria; therefore, no chemicals were retained as COCs for migration from soil to groundwater.

Quantitative estimates of noncarcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors. No noncarcinogenic toxicity criteria were available for the identified COPCs; therefore, noncarcinogenic risks could not be estimated.

ILCRs for all receptors exposed to surface soil and subsurface soil at SWMU 29 under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

TABLE 7-1

SCREENING CRITERIA USED IN SELECTION OF COPCS - SOIL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

CAS No.	Chemical	USEPA Regional Screening Levels[1]		Indiana Department of Environmental Management[2]	
		Adjusted Direct Contact Residential	Protection of Groundwater	Soil Direct	Migration to Groundwater
Semivolatile Organic Compounds (ug/kg)					
91-57-6	2-Methylnaphthalene	31,000 N	2,800	630,000 N	3,100 N
83-32-9	Acenaphthene	340,000 N	82,000	9,500,000 N	130,000 N
120-12-7	Anthracene	1,700,000 N	840,000	47,000,000 N	2,700,000 N
56-55-3	Benzo(a)anthracene	150 C	200	5,000 C	19,000 C
50-32-8	Benzo(a)pyrene	15 C	70	500 C	8,200 MCL
205-99-2	Benzo(b)fluoranthene	150 C	700	5,000 C	57,000 C
191-24-2	Benzo(g,h,i)perylene	170,000 N[3]	190,000 [3]	NA	NA
207-08-9	Benzo(k)fluoranthene	1,500 C	7,000	50,000 C	570,000 C
86-74-8	Carbazole	NA	NA	210,000 C	5,900 C
218-01-9	Chrysene	15,000 C	22,000	500,000 C	1,900,000 C
53-70-3	Dibenzo(a,h)anthracene	15 C	220	500 C	18,000 C
132-64-9	Dibenzofuran	7,800 N	2,200	370,000 N	4,900 N
206-44-0	Fluoranthene	230,000 N	1,400,000	6,300,000 N	6,300,000 N
86-73-7	Fluorene	230,000 N	80,000	6,300,000 N	170,000 N
193-39-5	Indeno(1,2,3-cd)pyrene	150 C	2,400	5,000 C	160,000 C
91-20-3	Naphthalene	3,600 C	9.4	3,200,000 N	700 N
85-01-8	Phenanthrene	170,000 N[3]	190,000 [3]	470,000 N	13,000 N
129-00-0	Pyrene	170,000 N	190,000	4,700,000 N	4,600,000 N
Petroleum Hydrocarbons (ug/kg)					
- -	DRO (C08-C28)	NA	NA	3,100,000	230,000

Notes:

1 - USEPA Regional Screening Level, November 2011. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$. The noncarcinogenic values are the RSL divided by 10 to correspond to a Target Hazard Quotient of 0.1. Protection of groundwater values are risk-based SSLs and have been multiplied by 20 to represent a dilution attenuation factor of 20.

2 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, May 2009).

3 - Value is for pyrene.

TABLE 7-2

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	Adjusted USEPA RSL Residential Soil[5]	IDEM Residential Soil Direct[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Semivolatile Organic Compounds													
83-32-9	Acenaphthene	7.3 J	36	ug/kg	29SS0020004	5/10	17 - 20	36	NA	340,000 N	9,500,000 N	No	BSL
120-12-7	Anthracene	9.7 J	75	ug/kg	29SS0020004	6/10	17 - 20	75	NA	1,700,000 N	47,000,000 N	No	BSL
56-55-3	**Benzo(a)anthracene**	11 J	280	ug/kg	29SS0020004	10/10	20 - 20	280	NA	**150 C**	5,000 C	**Yes**	ASL
50-32-8	**Benzo(a)pyrene**	7.3 J	320	ug/kg	29SS0020004	10/10	8 - 8	320	NA	**15 C**	500 C	**Yes**	ASL
205-99-2	**Benzo(b)fluoranthene**	15 J	500	ug/kg	29SS0020004	10/10	20 - 20	500	NA	**150 C**	5,000 C	**Yes**	ASL
191-24-2	Benzo(g,h,i)perylene	36 J	180	ug/kg	29SS0020004	9/10	17 - 20	180	NA	170,000 N[8]	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	28 J	150	ug/kg	29SS0020004	9/10	17 - 20	150	NA	1,500 C	50,000 C	No	BSL
86-74-8	Carbazole	12 J	62 J	ug/kg	29SS0020004	6/10	17 - 20	62	NA	NA	210,000 C	No	BSL
218-01-9	Chrysene	8 J	320	ug/kg	29SS0020004	10/10	20 - 20	320	NA	15,000 C	500,000 C	No	BSL
53-70-3	**Dibenzo(a,h)anthracene**	24 J	52 J	ug/kg	29SS0020004	3/10	7 - 36	52	NA	**15 C**	500 C	**Yes**	ASL
132-64-9	Dibenzofuran	10 J	15 J	ug/kg	29SS0080004	3/10	17 - 20	15	NA	7,800 N	370,000 N	No	BSL
206-44-0	Fluoranthene	20 J	540	ug/kg	29SS0020004	10/10	20 - 20	540	NA	230,000 N	6,300,000 N	No	BSL
86-73-7	Fluorene	8.1 J	28 J	ug/kg	29SS0080004	4/10	17 - 20	28	NA	230,000 N	6,300,000 N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	31 J	150	ug/kg	29SS0020004	9/10	35 - 40	150	NA	150 C	5,000 C	No	BSL
85-01-8	Phenanthrene	7.3 J	390	ug/kg	29SS0020004	10/10	20 - 20	390	NA	170,000 N[8]	470,000 N	No	BSL
129-00-0	Pyrene	10 J	1,100	ug/kg	29SS0020004	10/10	20 - 20	1,100	NA	170,000 N	4,700,000 N	No	BSL
Petroleum Hydrocarbons													
- -	DRO (C08-C28)	3,700 J	45,000 J	ug/kg	29SS0090004	7/10	2600 - 4000	45,000	NA	NA	3,100,000	No	BSL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) residential direct contact for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

29SS0010002	29SS0080004
29SS0020004	29SS0090004
29SS0040004	29SS0100002
29SS0050004	29SS0100002-D
29SS0060002	29SS0110002
29SS0070002	

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 7-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	USEPA RSL Protection of Groundwater[5]	IDEM Migration to Groundwater[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Semivolatile Organic Compounds													
83-32-9	Acenaphthene	7.3 J	36	ug/kg	29SS0020004	5/10	17 - 20	36	NA	82,000	130,000 N	No	BSL
120-12-7	Anthracene	9.7 J	75	ug/kg	29SS0020004	6/10	17 - 20	75	NA	840,000	2,700,000 N	No	BSL
56-55-3	**Benzo(a)anthracene**	11 J	280	ug/kg	29SS0020004	10/10	20 - 20	280	NA	**200**	19,000 C	**Yes**	ASL
50-32-8	**Benzo(a)pyrene**	7.3 J	320	ug/kg	29SS0020004	10/10	8 - 8	320	NA	**70**	8,200 MCL	**Yes**	ASL
205-99-2	Benzo(b)fluoranthene	15 J	500	ug/kg	29SS0020004	10/10	20 - 20	500	NA	700	57,000 C	No	BSL
191-24-2	Benzo(g,h,i)perylene	36 J	180	ug/kg	29SS0020004	9/10	17 - 20	180	NA	190,000 [8]	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	28 J	150	ug/kg	29SS0020004	9/10	17 - 20	150	NA	7,000	570,000 C	No	BSL
86-74-8	Carbazole	12 J	62 J	ug/kg	29SS0020004	6/10	17 - 20	62	NA	NA	5,900 C	No	BSL
218-01-9	Chrysene	8 J	320	ug/kg	29SS0020004	10/10	20 - 20	320	NA	22,000	1,900,000 C	No	BSL
53-70-3	Dibenzo(a,h)anthracene	24 J	52 J	ug/kg	29SS0020004	3/10	7 - 36	52	NA	220	18,000 C	No	BSL
132-64-9	Dibenzofuran	10 J	15 J	ug/kg	29SS0080004	3/10	17 - 20	15	NA	2,200	4,900 N	No	BSL
206-44-0	Fluoranthene	20 J	540	ug/kg	29SS0020004	10/10	20 - 20	540	NA	1,400,000	6,300,000 N	No	BSL
86-73-7	Fluorene	8.1 J	28 J	ug/kg	29SS0080004	4/10	17 - 20	28	NA	80,000	170,000 N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	31 J	150	ug/kg	29SS0020004	9/10	35 - 40	150	NA	2,400	160,000 C	No	BSL
85-01-8	Phenanthrene	7.3 J	390	ug/kg	29SS0020004	10/10	20 - 20	390	NA	190,000 [8]	13,000 N	No	BSL
129-00-0	Pyrene	10 J	1,100	ug/kg	29SS0020004	10/10	20 - 20	1,100	NA	190,000	4,600,000 N	No	BSL
Petroleum Hydrocarbons													
- -	DRO (C08-C28)	3,700 J	45,000 J	ug/kg	29SS0090004	7/10	2600 - 4000	45,000	NA	NA	230,000	No	BSL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. Values are based on a dilution attenuation factor of 20.
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) migration to groundwater for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
29SS0010002
29SS0020004
29SS0040004
29SS0050004
29SS0060002
29SS0070002
29SS0080004
29SS0090004
29SS0100002
29SS0100002-D
29SS0110002

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 7-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	Adjusted USEPA RSL Residential Soil[5]	IDEM Residential Soil Direct[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Semivolatile Organic Compounds													
91-57-6	2-Methylnaphthalene	8.7 J	8.7 J	ug/kg	29SB0050406	1/10	18 - 21	8.7	NA	31,000 N	630,000 N	No	BSL
83-32-9	Acenaphthene	130	160	ug/kg	29SB0050406	2/10	18 - 21	160	NA	340,000 N	9,500,000 N	No	BSL
120-12-7	Anthracene	7.7 J	260	ug/kg	29SB0050406, 29SB0110203	3/10	18 - 21	260	NA	1,700,000 N	47,000,000 N	No	BSL
56-55-3	**Benzo(a)anthracene**	26 J	640	ug/kg	29SB0110203	4/10	18 - 21	640	NA	**150 C**	5,000 C	**Yes**	ASL
50-32-8	**Benzo(a)pyrene**	22 J	540	ug/kg	29SB0110203	4/10	7.1 - 16	540	NA	**15 C**	**500 C**	**Yes**	ASL
205-99-2	**Benzo(b)fluoranthene**	28 J	690	ug/kg	29SB0110203	4/10	18 - 21	690	NA	**150 C**	5,000 C	**Yes**	ASL
191-24-2	Benzo(g,h,i)perylene	32 J	260	ug/kg	29SB0110203	3/10	18 - 21	260	NA	170,000 N[8]	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	24 J	280	ug/kg	29SB0110203	3/10	18 - 21	280	NA	1,500 C	50,000 C	No	BSL
86-74-8	Carbazole	170 J	170 J	ug/kg	29SB0050406, 29SB0110203	2/10	18 - 21	170	NA	NA	210,000 C	No	BSL
218-01-9	Chrysene	15 J	610	ug/kg	29SB0110203	4/10	18 - 21	610	NA	15,000 C	500,000 C	No	BSL
53-70-3	**Dibenzo(a,h)anthracene**	13 J	86	ug/kg	29SB0050406	3/10	7.1 - 16	86	NA	**15 C**	500 C	**Yes**	ASL
132-64-9	Dibenzofuran	38 J	84 J	ug/kg	29SB0050406	2/10	18 - 21	84	NA	7,800 N	370,000 N	No	BSL
206-44-0	Fluoranthene	49 J	1,700	ug/kg	29SB0110203	4/10	18 - 21	1,700	NA	230,000 N	6,300,000 N	No	BSL
86-73-7	Fluorene	120	170	ug/kg	29SB0050406	2/10	18 - 21	170	NA	230,000 N	6,300,000 N	No	BSL
193-39-5	**Indeno(1,2,3-cd)pyrene**	21 J	240	ug/kg	29SB0110203	3/10	35 - 41	240	NA	**150 C**	5,000 C	**Yes**	ASL
91-20-3	Naphthalene	11 J	11 J	ug/kg	29SB0050406	1/10	7.1 - 20	11	NA	3,600 C	3,200,000 N	No	BSL
85-01-8	Phenanthrene	21 J	1,000	ug/kg	29SB0050406, 29SB0110203	4/10	18 - 21	1,000	NA	170,000 N[8]	470,000 N	No	BSL
129-00-0	Pyrene	32 J	1,000	ug/kg	29SB0110203	4/10	18 - 21	1,000	NA	170,000 N	4,700,000 N	No	BSL
Petroleum Hydrocarbons													
- -	DRO (C08-C28)	4,700	310,000 J	ug/kg	29SB0050406	6/10	1500 - 3900	310,000	NA	NA	3,100,000	No	BSL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) residential direct contact for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples

29SB0010203	29SB0060206	29SB0110203
29SB0020406	29SB0070204	
29SB0030406	29SB0080406	
29SB0050406	29SB0090406	
29SB0060206	29SB0100204	

TABLE 7-5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	USEPA RSL Protection of Groundwater[5]	IDEM Migration to Groundwater[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Semivolatile Organic Compounds													
91-57-6	2-Methylnaphthalene	8.7 J	8.7 J	ug/kg	29SB0050406	1/10	18 - 21	8.7	NA	2,800	3,100 N	No	BSL
83-32-9	Acenaphthene	130	160	ug/kg	29SB0050406	2/10	18 - 21	160	NA	82,000	130,000 N	No	BSL
120-12-7	Anthracene	7.7 J	260	ug/kg	29SB0050406, 29SB0110203	3/10	18 - 21	260	NA	840,000	2,700,000 N	No	BSL
56-55-3	**Benzo(a)anthracene**	26 J	640	ug/kg	29SB0110203	4/10	18 - 21	640	NA	**200**	19,000 C	**Yes**	ASL
50-32-8	**Benzo(a)pyrene**	22 J	540	ug/kg	29SB0110203	4/10	7.1 - 16	540	NA	**70**	8,200 MCL	**Yes**	ASL
205-99-2	Benzo(b)fluoranthene	28 J	690	ug/kg	29SB0110203	4/10	18 - 21	690	NA	700	57,000 C	No	BSL
191-24-2	Benzo(g,h,i)perylene	32 J	260	ug/kg	29SB0110203	3/10	18 - 21	260	NA	190,000 [8]	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	24 J	280	ug/kg	29SB0110203	3/10	18 - 21	280	NA	7,000	570,000 C	No	BSL
86-74-8	Carbazole	170 J	170 J	ug/kg	29SB0050406, 29SB0110203	2/10	18 - 21	170	NA	NA	5,900 C	No	BSL
218-01-9	Chrysene	15 J	610	ug/kg	29SB0110203	4/10	18 - 21	610	NA	22,000	1,900,000 C	No	BSL
53-70-3	Dibenzo(a,h)anthracene	13 J	86	ug/kg	29SB0050406	3/10	7.1 - 16	86	NA	220	18,000 C	No	BSL
132-64-9	Dibenzofuran	38 J	84 J	ug/kg	29SB0050406	2/10	18 - 21	84	NA	2,200	4,900 N	No	BSL
206-44-0	Fluoranthene	49 J	1700	ug/kg	29SB0110203	4/10	18 - 21	1700	NA	1,400,000	6,300,000 N	No	BSL
86-73-7	Fluorene	120	170	ug/kg	29SB0050406	2/10	18 - 21	170	NA	80,000	170,000 N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	21 J	240	ug/kg	29SB0110203	3/10	35 - 41	240	NA	2,400	160,000 C	No	BSL
91-20-3	**Naphthalene**	11 J	11 J	ug/kg	29SB0050406	1/10	7.1 - 20	11	NA	**9.4**	700 N	**Yes**	ASL
85-01-8	Phenanthrene	21 J	1,000	ug/kg	29SB0050406, 29SB0110203	4/10	18 - 21	1,000	NA	190,000 [8]	13,000 N	No	BSL
129-00-0	Pyrene	32 J	1,000	ug/kg	29SB0110203	4/10	18 - 21	1,000	NA	190,000	4,600,000 N	No	BSL
Petroleum Hydrocarbons													
- -	**DRO (C08-C28)**	4,700	310,000 J	ug/kg	29SB0050406	6/10	1500 - 3900	310,000	NA	NA	**230,000**	**Yes**	ASL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. Values are based on a dilution attenuation factor of 20.
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) migration to groundwater for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

29SB0010203	29SB0070204
29SB0020406	29SB0080406
29SB0030406	29SB0090406
29SB0050406	29SB0100204
29SB0060206	29SB0110203
29SB0060206-D	

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 7-6

CHEMICALS RETAINED AS COPCs
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical	Surface Soil		Subsurface Soil	
	Direct Contact	Soil to Groundwater	Direct Contact	Soil to Groundwater
Semivolatile Organic Compounds				
Benzo(a)anthracene	E	E	E	E
Benzo(a)pyrene	E	E	E, I	E
Benzo(b)fluoranthene	E		E	
Dibenzo(a,h)anthracene	E		E	
Indeno(1,2,3-cd)pyrene			E	
Naphthalene				E
Petroleum Hydrocarbons				
DRO				I

Notes
E - Chemical exceeded USEPA screening criteria and was retained as a COPC.
I - Chemical exceeded IDEM screening criteria and was retained as a COPC.

TABLE 7-7

SELECTION OF EXPOSURE PATHWAYS
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE INDIANA
PAGE 1 OF 2

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	SWMU 29	Construction Worker	Adult	Ingestion Dermal	Quant Quant	Construction workers may contact surface soil during normal work activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Adolescent trespassers may contact surface soil while at the site.
		Air	SWMU 29	Construction Worker	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during work activities.
				Trespassers	Adolescent	Inhalation	Quant	Adolescent trespassers may be exposed to fugitive dust and volatile emissions while at the site.
	Subsurface Soil	Subsurface Soil	SWMU 29	Construction Worker	Adult	Ingestion Dermal	Quant Quant	Construction workers may contact subsurface soil during normal work activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Although industrial workers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Although adolescent trespassers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
		Air	SWMU 29	Construction Worker	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Although industrial workers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Inhalation	Quant	Although adolescent trespassers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
Future	Surface Soil	Surface Soil	SWMU 29	Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
				Recreational Users	Child	Ingestion Dermal	Quant Quant	A future child recreational user may be exposed to surface soil.
					Adult	Ingestion Dermal	Quant Quant	A future adult recreational user may be exposed to surface soil.
		Air	SWMU 29	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.

TABLE 7-7

SELECTION OF EXPOSURE PATHWAYS
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE INDIANA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Subsurface Soil	Subsurface Soil	SWMU 29	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Recreational Users	Child	Inhalation	Quant	Although child recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although adult recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
	Subsurface Soil	Air	SWMU 29	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Recreational Users	Child	Inhalation	Quant	Although child recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although adult recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.

Notes:
Quant - Quantitative.

TABLE 7-8

RECEPTORS AND EXPOSURE ROUTES FOR QUANTITATIVE EVALUATION
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Receptors	Exposure Routes
Construction Workers (current/future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust/emissions
Industrial Worker (current/future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust/emissions
Adolescent Trespassers (6 to 17 years) (current/future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust/emissions
Small Child (0 to 6 years) and Adult Recreational Users (future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust/emissions
On-Base Residents (Adult/Children) (future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust/emissions

TABLE 7-9

EXPOSURE POINT CONCENTRATIONS
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical	Surface Soil (mg/kg)	Subsurface Soil (mg/kg)
Semivolatile Organic Compounds		
Benzo(a)anthracene	0.15[(1)]	0.27[(3)]
Benzo(a)pyrene	0.16[(1)]	0.24[(3)]
Benzo(b)fluoranthene	0.26[(1)]	0.31[(3)]
Dibenzo(a,h)anthracene	0.033[(2)]	0.047[(3)]
Indeno(1,2,3-cd)pyrene	NA	0.11[(3)]

Notes
1 - 95% Approximate Gamma UCL
2 - 95% KM (t) UCL
3 - 95% KM (t) UCL

TABLE 7-10

SUMMARY OF EXPOSURE INPUT PARAMETERS
REASONABLE MAXIMUM EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE INDIANA

Parameter Code	Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	On-Site Child Resident	On-Site Adult Resident
All Exposures								
C_{soil}	Exposure concentration for soil (mg/kg)	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
ED	Exposure Duration (years)	1[2]	25[3]	10[4]	6[3]	24[3]	6[3]	24[3]
BW	Body Weight (kg)	70[3]	70[3]	43[5]	15[3]	70[3]	15[3]	70[3]
AT-N	Averaging Time (Non-Cancer) (days)	365[5]	9,125[5]	3,650[5]	2,190[5]	8,760[5]	2,190[5]	8,760[5]
AT-C	Averaging Time (Cancer) (days)	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]
Incidental Ingestion/Dermal Contact with Soil								
IR	Ingestion Rate (mg/day)	330[6]	100[3]	100[3]	200[3]	100[3]	200[3]	100[3]
EF	Exposure Frequency (days/year)	150[7]	250[3]	26[8]	52[9]	52[9]	350[3]	350[3]
FI	Fraction Ingested (unitless)	1[6]	1[3]	1[3]	0.5[2]	0.5[2]	1[3]	1[3]
SA	Skin Surface Available for Contact (cm^2)	3,300[10]	3,300[6,10]	3,280[11]	3,300[12]	9,070[13]	2,800[10]	5,700[10]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	0.3[10]	0.2[6,10]	0.2[10]	0.2[10]	0.07[10]	0.2[10]	0.07[10]
ABS	Absorption Factor (unitless)	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
CF	Conversion Factor (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil								
C_{air}	Exposure concentration for air (mg/m^3)	calculated[6]	calculated[6]	calculated[6]	calculated[6]	calculated[6]	calculated[6]	calculated[6]
ET	Exposure Time (hours/day)	8[14]	8[14]	4[2]	4[2]	4[2]	24[15]	24[15]
EF	Exposure Frequency (days/year)	150[7]	250[3]	26[8]	52[9]	52[9]	350[3]	350[3]
PEF	Particulate Emission Factor (m^3/kg)	1.34E+06[6]	1.316E+09[6,16]	1.316E+09[6,16]	1.316E+09[6,16]	1.316E+09[6,16]	1.316E+09[6,16]	1.316E+09[6,16]

Notes:

1 - U.S. EPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - Professional judgment.
3 - U.S. EPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.
4 - Adolescents ages 7 to 16 years old.
5 - U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
6 - U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
7 - Assumes a 30 week construction project over one year.
8 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.
9 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.
10 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
11 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
12 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.
13 - Assume that head, arms, hands, lower legs, and feet are exposed, U.S. EPA, 1997a.
14 - Assume an 8-hour work shift.
15 - U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
16 - IDEM RISC Technical Guide – January 31, 2006 Appendix 1 (Revised May 1, 2009).

TABLE 7-11

SUMMARY OF EXPOSURE INPUT PARAMETERS
CENTRAL TENDENCY EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE INDIANA

Parameter Code	Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	On-Site Child Resident	On-Site Adult Resident
All Exposures								
C_{soil}	Exposure concentration for soil (mg/kg)	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
ED	Exposure Duration (years)	1[2]	9[3]	10[4]	2[3]	7[3]	2[3]	7[3]
BW	Body Weight (kg)	70[3]	70[3]	43[3]	15[3]	70[3]	15[3]	70[3]
AT-N	Averaging Time (Non-Cancer) (days)	365[5]	3,285[5]	3,650[5]	730[5]	2,555[5]	730[5]	2,555[5]
AT-C	Averaging Time (Cancer) (days)	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]
Incidental Ingestion/Dermal Contact with Soil								
IR	Ingestion Rate (mg/day)	165[6]	50[3]	50[3]	100[3]	50[3]	100[3]	50[3]
EF	Exposure Frequency (days/year)	75[6]	219[3]	13[7]	26[8]	26[8]	234[3]	234[3]
FI	Fraction Ingested (unitless)	1[3]	1[3]	1[3]	0.5[2]	0.5[2]	1[3]	1[3]
SA	Skin Surface Available for Contact (cm^2)	3,300[9]	3,300[9]	3,280[10]	3,300[11]	9,070[12]	2,800[9]	5,700[9]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	0.1[9]	0.02[9]	0.04[9]	0.04[9]	0.01[9]	0.04[9]	0.01[9]
ABS	Absorption Factor (unitless)	chemical-specific[9]	chemical-specific[9]	chemical-specific[9]	chemical-specific[9]	chemical-specific[9]	chemical-specific[9]	chemical-specific[9]
CF	Conversion Factor (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil								
C_{air}	Exposure concentration for air (mg/m^3)	calculated[13]	calculated[13]	calculated[13]	calculated[13]	calculated[13]	calculated[13]	calculated[13]
ET	Exposure Time (hours/day)	8[14]	8[14]	2[2]	2[2]	2[2]	24[15]	24[15]
EF	Exposure Frequency (days/year)	75[6]	219[3]	13[7]	26[8]	26[8]	234[3]	234[3]
PEF	Particulate Emission Factor (m^3/kg)	1.34E+06[16]	1.316E+09[16]	1.316E+09[16]	1.316E+09[13,16]	1.316E+09[13,16]	1.316E+09[13,16]	1.316E+09[13,16]

Notes:

1 - U.S. EPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - Professional judgment.
3 - U.S. EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
4 - Adolescents ages 7 to 16 years old.
5 - U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
6 - Central tendency exposure is assumed to be one-half the reasonable maximum exposure value.
7 - Assume 1 day a week in warm weather months for RME and every other week for CTE.
8 - Assume 2 days a week in warm weather months for RME and one day a week for CTE.
9 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
10 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
11 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.
12 - Assume that head, arms, hands, lower legs, and feet are exposed (U.S. EPA, 1997a).
13 - U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.

TABLE 7-12

NON-CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds										
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

Definitions:

NA = Not Available.

TABLE 7-13

NON-CANCER TOXICITY DATA -- INHALATION
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[(1)]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds									
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - Extrapolated RfD = RfC *20m^3/day / 70 kg

Definitions:
NA = Not Applicable

TABLE 7-14

CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds								
Benzo(a)anthracene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(a)pyrene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	2/1/2012
Benzo(b)fluoranthene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Dibenzo(a,h)anthracene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Indeno(1,2,3-cd)pyrene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.
3 - Carcinogenic PAHs are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

IRIS = Integrated Risk Information System.

TABLE 7-15

CANCER TOXICITY DATA -- INHALATION
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds							
Benzo(a)anthracene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(a)pyrene[2]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(b)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Dibenzo(a,h)anthracene[2]	1.2E-03	$(ug/m^3)^{-1}$	4.2E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Indeno(1,2,3-cd)pyrene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Carcinogenic PAHs and are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

TABLE 7-16

SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Construction Workers	Surface Soil	Incidental Ingestion	5E-08	--	--	--	--	--
		Dermal Contact	2E-08	--	--	--	--	--
		Inhalation	4E-10	--	--	--	--	--
		Total	7E-08	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	7E-08	--	--	--	--	--
		Dermal Contact	3E-08	--	--	--	--	--
		Inhalation	6E-10	--	--	--	--	--
		Total	1E-07	--	--	--	--	--
Industrial Workers	Surface Soil	Incidental Ingestion	6E-07	--	--	--	--	--
		Dermal Contact	5E-07	--	--	--	--	--
		Inhalation	2E-11	--	--	--	--	--
		Total	1E-06	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	9E-07	--	--	--	--	--
		Dermal Contact	8E-07	--	--	--	--	--
		Inhalation	2E-11	--	--	--	--	--
		Total	2E-06	--	--	--	--	--
Adolescent Trespassers	Surface Soil	Incidental Ingestion	1E-07	--	--	--	--	--
		Dermal Contact	1E-07	--	--	--	--	--
		Inhalation	1E-12	--	--	--	--	--
		Total	2E-07	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	2E-07	--	--	--	--	--
		Dermal Contact	2E-07	--	--	--	--	--
		Inhalation	2E-12	--	--	--	--	--
		Total	4E-07	--	--	--	--	--
Child Recreational Users	Surface Soil	Incidental Ingestion	7E-07	--	--	--	--	--
		Dermal Contact	6E-07	--	--	--	--	--
		Inhalation	2E-12	--	--	--	--	--
		Total	1E-06	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	1E-06	--	--	--	--	--
		Dermal Contact	1E-06	--	--	--	--	--
		Inhalation	3E-12	--	--	--	--	--
		Total	2E-06	--	--	--	--	--
Adult Recreational Users	Surface Soil	Incidental Ingestion	1E-07	--	--	--	--	--
		Dermal Contact	2E-07	--	--	--	--	--
		Inhalation	3E-12	--	--	--	--	--
		Total	3E-07	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	2E-07	--	--	--	--	--
		Dermal Contact	3E-07	--	--	--	--	--
		Inhalation	4E-12	--	--	--	--	--
		Total	4E-07	--	--	--	--	--
Lifelong Recreational Users	Surface Soil	Incidental Ingestion	9E-07	--	--	--	NA	--
		Dermal Contact	8E-07	--	--	--	NA	--
		Inhalation	5E-12	--	--	--	NA	--
		Total	2E-06	--	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	1E-06	--	--	--	NA	--
		Dermal Contact	1E-06	--	--	--	NA	--
		Inhalation	8E-12	--	--	--	NA	--
		Total	3E-06	--	--	Benzo(a)pyrene	NA	--

TABLE 7-16

SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Child Residents	Surface Soil	Incidental Ingestion	1E-05	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	4E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	9E-11	--	--	--	--	--
		Total	1E-05	--	--	Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	--	--
	Subsurface Soil	Incidental Ingestion	2E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	--	--
		Dermal Contact	6E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	1E-10	--	--	--	--	--
		Total	2E-05	--	--	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	--	--
Adult Residents	Surface Soil	Incidental Ingestion	1E-06	--	--	--	--	--
		Dermal Contact	8E-07	--	--	--	--	--
		Inhalation	1E-10	--	--	--	--	--
		Total	2E-06	--	--	Benzo(a)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	2E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	1E-06	--	--	--	--	--
		Inhalation	2E-10	--	--	--	--	--
		Total	3E-06	--	--	Benzo(a)pyrene	--	--
Lifelong Residents	Surface Soil	Incidental Ingestion	1E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	NA	--
		Dermal Contact	4E-06	--	--	Benzo(a)pyrene	NA	--
		Inhalation	2E-10	--	--	--	NA	--
		Total	2E-05	--	--	Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	NA	--
	Subsurface Soil	Incidental Ingestion	2E-05	--	--	Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	NA	--
		Dermal Contact	7E-06	--	--	Benzo(a)pyrene	NA	--
		Inhalation	3E-10	--	--	--	NA	--
		Total	2E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	NA	--

TABLE 7-17

SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

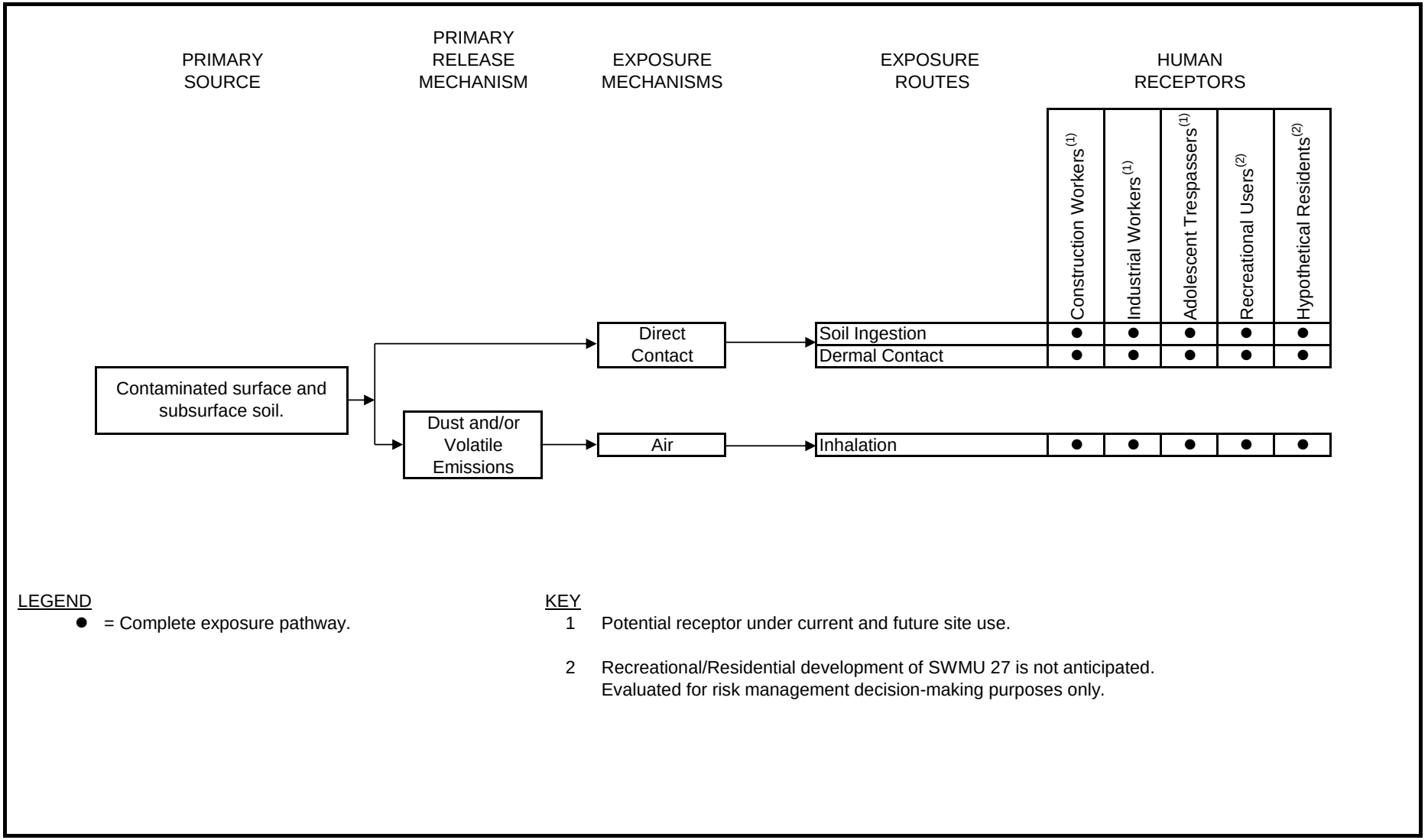
Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Construction Workers	Surface Soil	Incidental Ingestion	1E-08	--	--	--	--	--
		Dermal Contact	3E-09	--	--	--	--	--
		Inhalation	2E-10	--	--	--	--	--
		Total	2E-08	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	2E-08	--	--	--	--	--
		Dermal Contact	5E-09	--	--	--	--	--
		Inhalation	3E-10	--	--	--	--	--
		Total	2E-08	--	--	--	--	--
Industrial Workers	Surface Soil	Incidental Ingestion	9E-08	--	--	--	--	--
		Dermal Contact	2E-08	--	--	--	--	--
		Inhalation	5E-12	--	--	--	--	--
		Total	1E-07	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	1E-07	--	--	--	--	--
		Dermal Contact	2E-08	--	--	--	--	--
		Inhalation	8E-12	--	--	--	--	--
		Total	2E-07	--	--	--	--	--
Adolescent Trespassers	Surface Soil	Incidental Ingestion	3E-08	--	--	--	--	--
		Dermal Contact	1E-08	--	--	--	--	--
		Inhalation	3E-13	--	--	--	--	--
		Total	4E-08	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	5E-08	--	--	--	--	--
		Dermal Contact	2E-08	--	--	--	--	--
		Inhalation	4E-13	--	--	--	--	--
		Total	6E-08	--	--	--	--	--
Child Recreational Users	Surface Soil	Incidental Ingestion	8E-08	--	--	--	--	--
		Dermal Contact	3E-08	--	--	--	--	--
		Inhalation	2E-13	--	--	--	--	--
		Total	1E-07	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	1E-07	--	--	--	--	--
		Dermal Contact	4E-08	--	--	--	--	--
		Inhalation	3E-13	--	--	--	--	--
		Total	2E-07	--	--	--	--	--
Adult Recreational Users	Surface Soil	Incidental Ingestion	7E-09	--	--	--	--	--
		Dermal Contact	3E-09	--	--	--	--	--
		Inhalation	2E-13	--	--	--	--	--
		Total	1E-08	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	1E-08	--	--	--	--	--
		Dermal Contact	5E-09	--	--	--	--	--
		Inhalation	3E-13	--	--	--	--	--
		Total	2E-08	--	--	--	--	--
Lifelong Recreational Users	Surface Soil	Incidental Ingestion	8E-08	--	--	--	NA	--
		Dermal Contact	3E-08	--	--	--	NA	--
		Inhalation	4E-13	--	--	--	NA	--
		Total	1E-07	--	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	1E-07	--	--	--	NA	--
		Dermal Contact	4E-08	--	--	--	NA	--
		Inhalation	6E-13	--	--	--	NA	--
		Total	2E-07	--	--	--	NA	--

TABLE 7-17

SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Child Residents	Surface Soil	Incidental Ingestion	1E-06	--	--	--	--	--
		Dermal Contact	2E-07	--	--	--	--	--
		Inhalation	2E-11	--	--	--	--	--
		Total	2E-06	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	2E-06	--	--	--	--	--
		Dermal Contact	3E-07	--	--	--	--	--
		Inhalation	4E-11	--	--	--	--	--
		Total	2E-06	--	--	Benzo(a)pyrene	--	--
Adult Residents	Surface Soil	Incidental Ingestion	1E-07	--	--	--	--	--
		Dermal Contact	2E-08	--	--	--	--	--
		Inhalation	2E-11	--	--	--	--	--
		Total	1E-07	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	2E-07	--	--	--	--	--
		Dermal Contact	3E-08	--	--	--	--	--
		Inhalation	3E-11	--	--	--	--	--
		Total	2E-07	--	--	--	--	--
Lifelong Residents	Surface Soil	Incidental Ingestion	1E-06	--	--	--	NA	--
		Dermal Contact	2E-07	--	--	--	NA	--
		Inhalation	3E-11	--	--	--	NA	--
		Total	2E-06	--	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	2E-06	--	--	Benzo(a)pyrene	NA	--
		Dermal Contact	3E-07	--	--	--	NA	--
		Inhalation	7E-11	--	--	--	NA	--
		Total	3E-06	--	--	Benzo(a)pyrene	NA	--

FIGURE 7-1
CONCEPTUAL SITE MODEL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA



LEGEND

● = Complete exposure pathway.

KEY

1 Potential receptor under current and future site use.

2 Recreational/Residential development of SWMU 27 is not anticipated. Evaluated for risk management decision-making purposes only.

FIGURE 7-2
SUMMARY OF CANCER RISKS - REASONABLE MAXIMUM EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

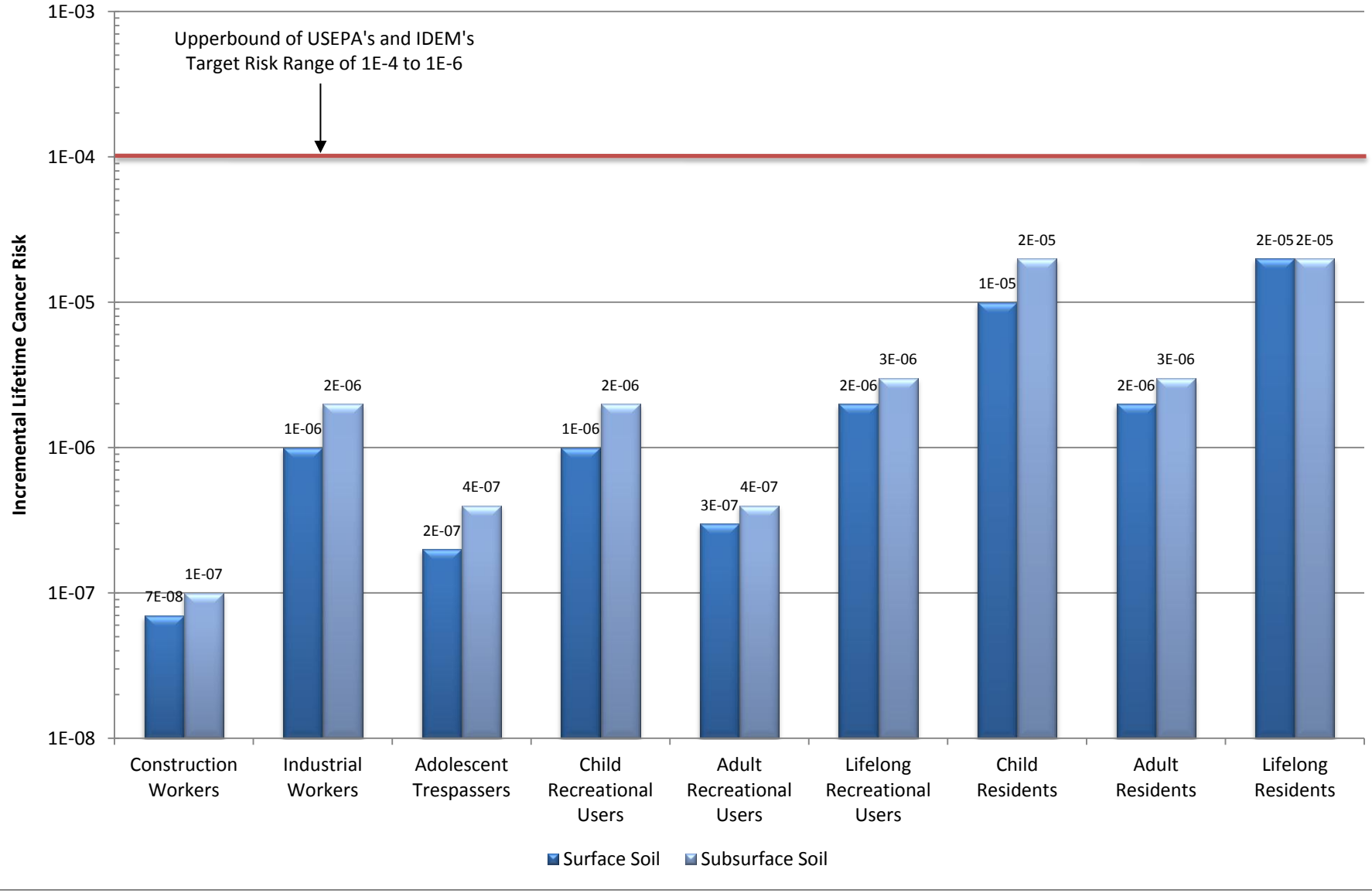
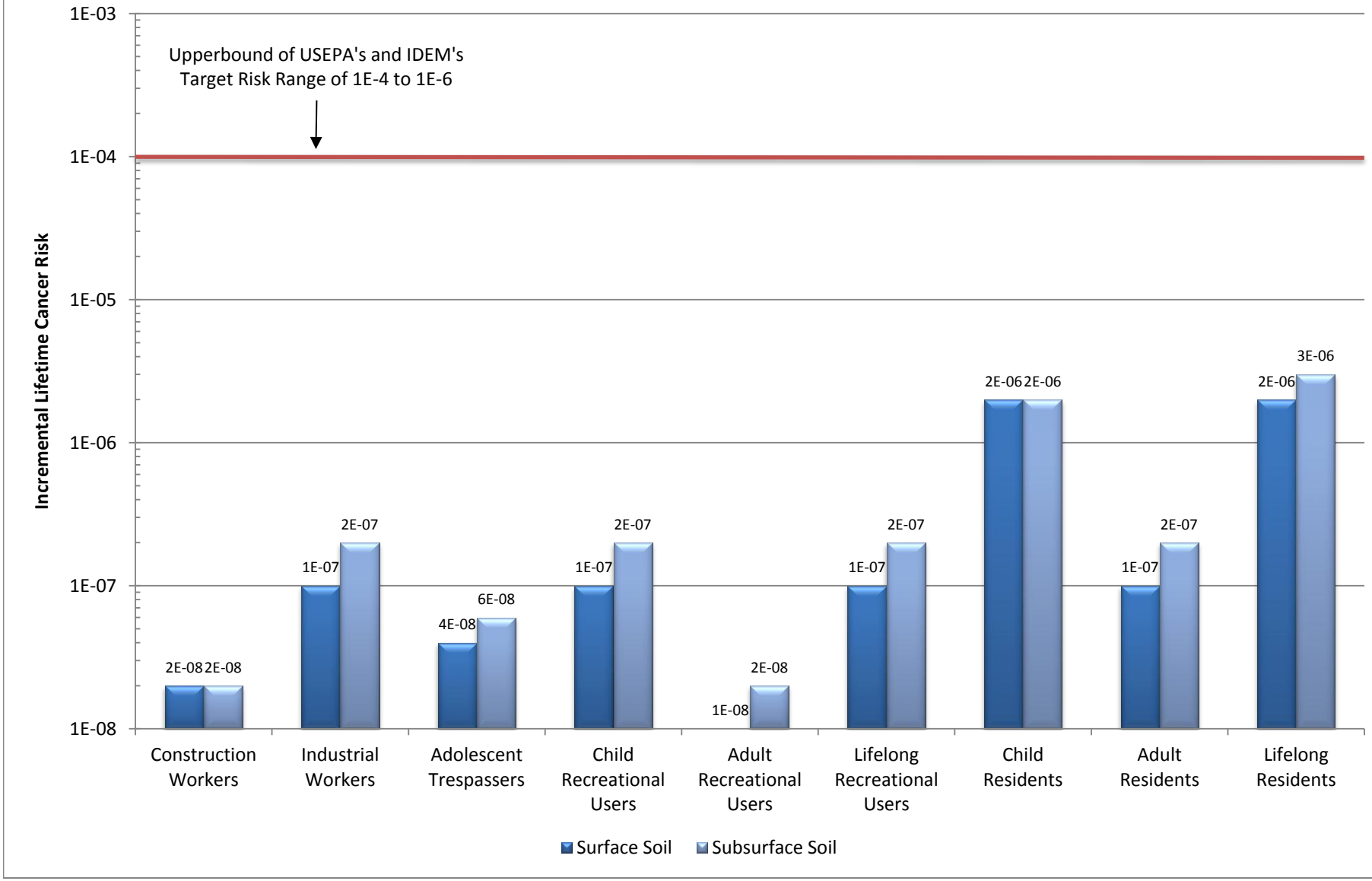


FIGURE 7-3
SUMMARY OF CANCER RISKS - CENTRAL TENDENCY EXPOSURES
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA



8.0 ECOLOGICAL RISK ASSESSMENT

The goal of this screening-level ERA for SWMU 29 was to evaluate the potential for adverse ecological impacts due to site-related contamination. This goal was accomplished by identifying COPCs detected at concentrations that exceeded screening levels, identifying the locations of these exceedances, and concluding whether or not further investigation and/or remedial action at SWMU 29 NSA Crane was warranted from an ecological perspective.

8.1 INTRODUCTION

The screening-level ERA methodology used at NSA Crane was in accordance with the following guidance documents:

- Department of Navy (Navy) Environmental Policy Memorandum 97-04: Use of Ecological Risk Assessments dated May 16, 1997 (Navy, 1997).
- Navy Policy for Conducting Ecological Risk Assessments (Navy, 1999).
- Final Guidelines for Ecological Risk Assessment (USEPA, 1998).
- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997).

This ERA consisted of Steps 1, 2, and 3a of the eight-step ecological risk evaluation process discussed in USEPA guidance (USEPA, 1997 and 1998) and the Navy Policy for Conducting ERAs (Navy, 1999). The first two screening steps comprised the screening-level ERA, and corresponded with Tier 1 of the Navy Policy (Navy, 1999), where conservative exposure estimates were compared to screening-level and threshold toxicity values. Step 3a was the first step of an ecological risk assessment (ERA) and consisted of refining the Tier 1 assumptions following Steps 1 and 2 to further focus the ERA process on the chemicals of greatest concern at the site. Step 3a corresponded with the first part of Tier 2 of the Navy Policy (Navy, 1999). Steps 3b through 7, which are conducted if additional ecological investigations are necessary, were not conducted for this ERA because no such investigations were carried out at the site. Aspects of Step 8, risk management, are addressed throughout the ERA process, in cooperation with Region 5 regulators.

A schematic diagram of the general risk assessment process is provided on Figure 8-1.

8.2 TIER 1, STEP 1: SCREENING-LEVEL PROBLEM FORMULATION

The screening-level problem formulation is the first step of the ERA and includes identification of potential receptor groups, COPCs, and the mechanisms for contaminant fate, transport, and toxicity. The complete exposure pathways that exist at a site are determined at this point to facilitate receptor selection. The problem formulation process enables the risk assessor to identify the ecological resources to be protected (known as assessment endpoints), the measures used to evaluate risks to those resources (known as measurement endpoints) and the chemicals, geographic areas, and environmental media relevant to the risk assessment.

As part of receptor identification, site habitats and potential ecological receptors, as they apply to ecological risk, are described in the following subsections.

8.2.1 Environmental Setting

8.2.1.1 Basewide Environmental Setting

A biological characterization of NSA Crane, including a list of plants and animals found at the facility, is presented in the Installation Assessment (IA) (Army, 1978) and the Initial Assessment Study (IAS) (NEESA, 1983), and is summarized in the Environmental Monitoring Reports (EMRs) (Halliburton NUS, 1992a and 1992b). A list of species that may inhabit NSA Crane and are protected under the United States Endangered Species Act, Indiana Department of Natural Resources Heritage Data Center, or the United States Fish and Wildlife Service (USFWS) is summarized in the RCRA Facility Permit and below. The following paragraphs briefly summarize the environmental setting at the base.

Eighty percent of NSA Crane's approximately 63,000 acres is classified as Central Hardwoods Forest of the United States (NEESA, 1983). In addition, some former agricultural fields are in various stages of succession. Open spaces on dry upland sites contain almost pure stands of grasses with some clumps of woody plants such as persimmon, sassafras, and sumac. Wetter sites have river birch, willow, sycamore, and cottonwood. Hillside communities have mostly hickory, white and black oak, red maple, sugar maple, tulip poplar, ash, and beech (NEESA, 1983).

The great variety of habitats at NSA Crane (i.e., many stages of forest succession, streams, ponds, Lake Greenwood, grassy open spaces) lead to great diversity of animal species (NEESA, 1983). These species include but are not limited to mammals such as white-tailed deer, beaver, coyote, hawks, red fox,

rabbits, raccoons, and mice; birds such as ducks, geese, wild turkey, bobwhite quail, red-tailed hawks, and American robins; as well as various amphibians, reptiles, fish, and invertebrates.

Six main creeks receive drainage in five separate drainage basins at NSA Crane: First Creek, Sulphur Creek, Little Sulphur Creek, Boggs Creek, Turkey Creek, and Seed Tick Creek. There are also many smaller streams, creeks, and drainage ditches located at the facility, along with several small man-made ponds and one large lake (Lake Greenwood). Lake Greenwood is the source of potable water for NSA Crane. Surface water from the facility eventually discharges to the East Fork of the White River, which is located south of the facility.

Threatened and Endangered Species

The Endangered Species Management Plan for NSA Crane (Comarco Systems, 2000) identified the federal and state threatened and endangered species and species of special concern potentially present at the facility. Information included in the Endangered Species Management Plan was obtained from studies and surveys conducted by the Navy and other agencies and groups such as universities and research institutions. A small subset of these studies include the inventory of neotropical migratory birds, mist net and radio telemetry surveys for the Indiana bat, bobcat trapping, rattlesnake survey, Purdue University wildlife studies, and several fish surveys and bird counts. These studies and others that were used in compiling the list of endangered species present at NSA Crane are described in more detail in the Endangered Species Management Plan (Comarco Systems, 2000) and below.

The Indiana bat is the only federally threatened or endangered species documented to occur at NSA Crane. No mist nets were located at SWMU 29 during the mist net and radio telemetry surveys for the Indiana bat; however, one mist net site was located approximately 1 mile northeast of SWMU 29 (ESI, 2005). No Indiana bats were captured at the location northeast of SWMU 29 in June 2005.

The USFWS issued a notice in the Federal Register (72 FR 37346 et seq.) on July 9, 2007, that effective August 8, 2007, the American bald eagle would be removed from the Federal List of Endangered and Threatened Wildlife and Plants. The American bald eagle is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The bald eagle is known to be present at Lake Greenwood, approximately 800 feet north of SWMU 29.

In addition, a number of state endangered and federal and state species of concern have been listed for NSA Crane (Comarco Systems, 2000). The state endangered species list includes two mammals (bobcat

and Indiana bat), one reptile (timber rattlesnake), and several birds (bald eagle, osprey, loggerhead shrike, yellow-crowned night-heron, Virginia rail, king rail, and Henslow's sparrow).

8.2.1.1 Site-Specific Environmental Setting

SWMU 29 is located in the north central portion of NSA Crane. The site covers approximately 1.6 acres; however, the potentially impacted area is thought to be only 0.05 acres. The southern portion of the site consists of mowed grass and the northern portion of the site is forested (see Figure 1-3). Areas west, north, and east of the site are also forested.

Lake Greenwood is located approximately 800 feet north of the site. A small tributary, located approximately 300 feet west of SWMU 29, drains into Boggs Creek, which eventually drains into the East Fork of the White River and then to the Wabash River to the southwest.

8.2.2 Potential Sources of Contamination

A former PCP wood preservation dip tank was operated within SWMU 29 and was likely used to treat wooden pallets. PCP solution may have been released to the environment via tank leaks and/or during process steps that may have allowed PCP solution to drip onto soil.

8.2.3 Physical and Chemical Characteristics

SVOCs were detected in soil samples from SWMU 29. Physical and chemical characteristics of contaminants may affect their mobility, transport, and bioavailability in the environment. These characteristics include bioaccumulation factors (BAFs), K_{OC}s, and K_{OW}s. The physical and chemical characteristics of SVOCs are presented in Section 6 and BAFs are presented in Appendix F.

8.2.4 Potential Exposure Pathways

Section 1 of this report presents in more detail, descriptions of the operational history, previous investigations, and the potential sources of contamination for SWMU 29, chemicals may have been deposited on the surface soil from operation of the PCP Dip Tank.

Several groups of terrestrial ecological receptors can be exposed to contaminants in surface soil. Invertebrates such as earthworms are exposed to contaminants as they move through the soil and ingest soil particles while searching for food. Plants are exposed to contaminants via direct contact as

contaminants are absorbed through the roots, and contaminants are then translocated to different parts of the plants (e.g., leaves, seeds). These pathways are evaluated in the ERA.

Small mammals may be exposed to contaminants in soil via several exposure routes. They may be exposed by direct contact as they search for food or burrow into the soil. Exposure of terrestrial wildlife to contaminants in the soil via dermal contact is unlikely to represent a major exposure pathway because fur, feathers, and chitinous exoskeletons are expected to minimize transfer of contaminants across dermal tissue. Therefore, the dermal pathway was not evaluated in the ERA. Small mammals also may be exposed to contaminants in soil via incidental ingestion of soil and ingestion of plants and/or invertebrates that have accumulated contaminants from the soil. These pathways are evaluated in the ERA.

Larger predatory species such as the red fox and red-tailed hawk can be indirectly exposed to soil contaminants by ingesting small mammals that have accumulated contaminants from soil.

Terrestrial receptors are not substantially exposed to subsurface soils, so that pathway was not evaluated in the ERA. For this project, the surface soil depth interval was 0 to 2 feet or 0 to 4 feet bgs, based on the depth of construction fill material observed on site.

8.2.5 Assessment Endpoints and Measurement Endpoints

Assessment endpoints are explicit expressions of the environmental value that is to be protected (USEPA, 1997). The selection of these endpoints is based on the habitats present, migration pathways of probable contaminants, and relevant exposure routes for the receptors. Measurement endpoints are estimates of measurable biological impacts (e.g., mortality, growth, and reproduction) that are used to evaluate the assessment endpoints. The assessment endpoints and measurement endpoints used to evaluate SWMU 29 data are presented in Table 8-1.

8.2.5.1 Assessment Endpoints

Based on the habitat at SWMU 29, which consists of grass and forested areas, and the chemicals present at the site, the assessment endpoints include protection of the following groups of receptors from adverse effects of contaminants on their growth, survival, and reproduction:

- Terrestrial vegetation
- Soil invertebrates

- Herbivorous birds and mammals
- Invertivorous birds and mammals

The following paragraphs discuss the above assessment endpoints.

Terrestrial Vegetation: Terrestrial vegetation at SWMU 29 consists of grasses, shrubs, and trees. They serve as a food source and provide shade and cover for many organisms, and they help to prevent soil erosion, among other important functions. They also can accumulate some contaminants that can then be transferred to the higher trophic-level organisms that consume plants.

Soil Invertebrates: Soil invertebrates are present in soil at SWMU 29. They aid in the formation of soil and the redistribution and decomposition of organic matter in the soil, and they serve as a food source for higher trophic-level organisms. They also can accumulate bioaccumulative contaminants that can then be transferred to the higher trophic-level organisms that consume soil invertebrates.

Herbivorous Birds and Mammals: Herbivorous birds and mammals (i.e., animals that consume only plant tissue) forage in some portions of SWMU 29. Their role in the community is essential because, without them, higher trophic levels could not exist (Smith, 1966). They may be exposed to and accumulate contaminants present in the plants they consume.

Invertivorous Birds and Mammals: Invertivorous birds and mammals are present throughout the base in different terrestrial habitats (e.g., forested, open field) and are present at SWMU 29. These are considered first-level carnivores, and they serve as a food source for higher trophic-level carnivores. They may be exposed to and accumulate contaminants present in the food items they consume.

As indicated in USEPA guidance (USEPA, 1997), “it is not practical or possible to directly evaluate risks to all of the individual components of the ecosystem at a site. Instead, assessment endpoints focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site.” Therefore, the ERA will focus on the endpoints that will tend to yield the highest risks, which should then account for endpoints that will have lower risks.

Omnivores were not selected as assessment endpoints because exposure to contaminants in plants is greatest for herbivores, and exposure to contaminants in animals is greatest for invertivores. Therefore, omnivores are protected by protecting herbivores and invertivores. Large carnivorous birds and mammals were not selected as assessment endpoints because their home range (hundreds of acres) is much larger than SWMU 29 (approximately 1.6 acres for the entire site, and 0.05 acres for the potentially

impacted area), so they would only consume a small portion of food from the site. Therefore, risks would be greater to small mammals and birds that may obtain all of their food from the site. Although reptiles may be present, they were not selected as assessment endpoints because of the general lack of toxicity information and the lack of methods to evaluate their exposure to chemicals.

8.2.5.2 Measurement Endpoints

The following measurement endpoints were used to evaluate the assessment endpoints in the ERA:

- Soil screening values - Mortality, growth, and reproduction of plants and soil invertebrates were evaluated by comparing the measured concentrations of chemicals in surface soil to screening values designed to be protective of ecological receptors.

- Wildlife toxicity reference values (TRVs) - Mortality, reproductive, and/or developmental effects of birds and mammals were evaluated by comparing the estimated dose incurred (based on conservative and average assumptions) from ingestion of contaminants in surface soil, plants, and invertebrates to wildlife TRVs.

8.2.5.3 Selection of Receptor Species

Many receptors in the soil environment at SWMU 29 are typically grouped into general categories such as invertebrates and vegetation. This is a reflection of the nature of the threshold values, effects values, or criteria typically used to characterize risk for such organisms. However, for vertebrate receptors, selection of a representative species is required so that risks to these upper-level species incurred by intake through eating and drinking can be estimated.

Ingestion is the primary route of exposure for most mammals and birds. The selection of species used to represent the receptor groups identified in Section 8.2.5.1 was based on considerations of their preferred habitat, body size, sensitivity to contaminants, home range, abundance, commercial or sport utilization, legal status, and functional role (e.g., predators). The availability of exposure parameters such as body mass, feeding rate, and drinking rate was also a factor in selecting surrogate species. The following surrogate species were used in the food chain modeling conducted as part of this ERA:

- Herbivorous mammal - Meadow vole
- Herbivorous bird - Bobwhite quail

- Invertivorous mammal - Short-tailed shrew
- Invertivorous bird - American woodcock

Receptor profiles for each of the species above are presented in Appendix F.

8.2.6 Conceptual Site Model

A CSM in ERA problem formulation is a written description of predicted relationships between ecological entities and the stressors to which they may be exposed (USEPA, 1998). The CSM consists of two primary components: predicted relationships among stressor, exposure, and assessment endpoint response, and a diagram that illustrates the relationships (USEPA, 1998). At SWMU 29, the primary source of the chemicals is the PCP Dip Tank. PCP and SVOCs may have been released to the environment via operation of the PCP Dip Tank. The primary stressors to ecological receptors are contaminants in surface soil. The primary receptors for contaminants in surface soil are plants and soil invertebrates and secondary receptors are birds and mammals. Figure 8-2 represents the ecological CSM for SWMU 29.

8.3 TIER 1, STEP 2: SCREENING-LEVEL EXPOSURE ESTIMATE AND RISK QUOTIENTS

8.3.1 Ecological Effects Evaluation

The preliminary ecological effects evaluation is an investigation of the relationship between the magnitude of exposure to a chemical and the nature and magnitude of adverse effects resulting from exposure. In addition to being a toxicological evaluation, it may also include descriptions of apparent effects seen during the site visit (e.g., stressed vegetation). Toxicity thresholds are usually expressed in units of concentration when the medium of concern is in intimate contact with the receptor, such as soil for soil invertebrates. For other receptors, such as terrestrial vertebrates, toxicity data are typically available as doses, with units equal to mass of contaminant per unit of body mass per unit of time (usually mg/kg-day).

8.3.2 Exposure Characterization

As the first step in the ecological effects evaluation, COPCs were selected by comparing contaminant concentrations in surface soil to ecological screening levels. For surface soil, chemical concentrations were compared to USEPA Ecological Soil Screening Levels (Eco SSLs) (USEPA, 2005 and supporting documents) because they are the most current screening levels. If USEPA Eco SSLs were not available, Region 5 soil ESLs (USEPA, 2003) were used next in order of preference, followed by the values from Canadian Soil Quality Guidelines (CCME, 2010) and the Oak Ridge National Laboratory (ORNL)

Toxicological Benchmarks for plants (Efroymson et al., 1997a) and invertebrates (Efroymson et al., 1997b). Note that because most of the Region 5 ESLs are based on risks to mammals, screening levels specific to plants or invertebrates from other sources were used preferentially for those endpoints, when available. In fact, because of the limited number of detections at this site, no Region 5 ESLs were selected as screening levels for any chemical. Table 8-2 presents the SSLs for plants, invertebrates, mammals, and birds for each chemical and the sources of each value.

The doses in mg/kg-day were estimated for terrestrial wildlife (mammals and birds) using exposure dose equations. Note that the food chain models were conducted on a dry-weight basis to be consistent with the soil concentrations, which are reported on a dry-weight basis. Therefore, the concentrations in the food items were estimated on a dry-weight basis. The following generic equation was used to calculate the EPCs for terrestrial wildlife from exposure to chemicals in soil and associated food items such as plants and soil invertebrates:

$$CDI = \frac{[(Cf * If) + (Cs * Is)] * H}{BW}$$

Where: CDI = Chronic daily intake [milligrams per kilogram (mg/kg)-day]
Cf = Chemical concentration in food – (see discussion below)
Cs = Chemical concentration in surface soil (mg/kg)
If = Food ingestion rate [kilograms per day (kg/day)]
Is = Incidental surface soil ingestion rate (kg/day)
H = Portion of food intake from the contaminated area (unitless)
BW = Body weight (kg)

The exposure factors used for the food chain model, their derivation, and the receptor profiles for the surrogate species are presented in Appendix F. The exposure assumptions (i.e., ingestion rate, body weight) were obtained primarily from the Wildlife Exposure Factors Handbook (USEPA, 1993) and USEPA Eco SSL Guidance Attachment 4-1 (USEPA, 2007a) with other sources used as necessary. Food ingestion rates are on a dry-weight basis as discussed above.

Chemical concentrations in food items for soil invertivorous and herbivorous receptors were calculated using soil-to-invertebrate or soil-to-plant BAFs and regression equations from the USEPA Eco SSL Guidance Document Attachment 4-1 (USEPA, 2007a). The BAFs are documented in Appendix F. The following equation was used to calculate chemical concentrations in plants or invertebrates when BAFs were used:

$$Cf = Cs * BAF$$

Where: Cf = Contaminant concentration in food (mg/kg)
Cs = Contaminant concentration in surface soil (mg/kg)
BAF = Biota-soil bioaccumulation factor (unitless)

The food chain model scenarios were calculated using various exposure assumptions to present a range of potential risks. For selecting chemicals as COPCs, the following Tier 1 exposure assumptions were used:

- Maximum soil concentrations
- Conservative receptor body weight and ingestion rates
- Receptors spend 100% of their time at the Site

8.3.3 Risk Characterization

An Ecological Effects Quotient (EEQ) approach was used to characterize the risk to ecological receptors. This approach characterizes potential effects by comparing exposure concentrations with effects data. The EEQs for terrestrial receptors were calculated as follows:

$$EEQ = \frac{Css}{SSSL}$$

where: EEQ = Ecological Effects Quotient (unitless)
C_{ss} = Contaminant concentration in surface soil (µg/kg)
SSSL = Surface soil screening level (µg/kg)

The EEQs for terrestrial wildlife were calculated as follows:

$$EEQ = \frac{CDI}{TRV}$$

where: EEQ = Ecological effects Quotient (unitless)
CDI = Chronic daily intake dose (mg/kg-day)
TRV = Toxicity reference value (NOAEL or LOAEL) (mg/kg-day)

An EEQ of greater than 1.0 was considered to indicate potential risk. Such values do not necessarily indicate that an effect will occur but only that a low (i.e., conservative) threshold has been exceeded.

8.3.4 Tier 1, Step 2: Selection of Contaminants of Potential Concern

Table 8-3 provides the results of the COPC selection for surface soil. Table 8-4 presents the results of the Tier 1 food chain model. The following rules were used to select COPCs for SWMU 29:

- A contaminant was selected as a COPC for risks to terrestrial plants and soil invertebrates if the maximum detected concentration in surface soil exceeded the associated screening level or a screening level was not available.

- If a contaminant had a maximum detected concentration that exceeded the associated screening level for birds or mammals, or a screening level was not available for a bioaccumulative chemical, then the chemical was retained for food chain modeling for wildlife. If the EEQs were greater than 1.0, based on the conservative food chain model, the chemical was selected as a COPC.

Contaminants retained as COPCs were further evaluated as part of Step 3a of the eight-step ERA process.

8.3.4.1 Terrestrial Plants

Twelve semivolatiles were selected as COPCs because screening levels were not available.

8.3.4.2 Soil Invertebrates

Two semivolatiles were selected as COPCs because screening levels were not available.

8.3.4.3 Wildlife

No chemicals had EEQs greater than 1.0 in the food chain model using maximum concentrations and Tier 1 input parameters. Therefore, no chemicals were selected as COPCs for wildlife. Appendix F presents the calculation worksheets.

8.4 TIER 2, STEP 3A – COPC REFINEMENT

Step 3a consists of refining the conservative exposure assumptions/concentrations used to evaluate potential risks to ecological receptors and re-evaluating the analytical data using benchmarks that are more appropriate for the assessment endpoints. The objective of the Step 3a refinement was to better determine which chemicals contribute to potentially unacceptable levels of ecological risk, and to identify and eliminate from further consideration those COPCs that were initially selected as COPCs because of the use of very conservative exposure scenarios but are not likely causing a significant risk. The Step 3a evaluation can also be used to eliminate chemicals from further evaluation for certain groups of receptors that are not at significant risk. For example, a chemical might not be retained as a COPC in soil for plants based on low risks to plants but the same chemical might be retained as a COPC based on risks to invertebrates or wildlife. This is important because if the site proceeds further to a BERA, the studies in the BERA should only focus on the receptors that are at potential risk.

For chemicals evaluated further in Step 3a, the following factors were evaluated, as appropriate, to determine if the risks are great enough to warrant additional evaluations (i.e., proceed to a BERA, develop cleanup levels, proceed to a Corrective Measures Study [CMS]). All of these factors may not be discussed for each chemical and/or receptor group.

- Magnitude of criterion exceedance: Although the magnitude of risks may not relate directly to the magnitude of a criterion exceedance, the magnitude of the criterion exceedance may be one item used in a lines-of-evidence approach to determine the need for further site evaluation. The greater the criterion exceedance, the greater the probability and concern that an unacceptable risk exists.

- Frequency of chemical detection and spatial distribution: A chemical detected at a low frequency typically is of less concern than a chemical detected at higher frequency if toxicity and concentrations and spatial areas represented by the data are similar. All else being equal, chemicals detected frequently were given greater consideration than those detected relatively infrequently. In addition, the spatial distribution of a chemical may be evaluated to determine the area that a sample represents.

- Habitat: Although exceedances of criteria may occur, potential risks to ecological receptors may be minimal if there is little habitat for those receptors. Therefore, the extent of habitat was used qualitatively when considering additional evaluation. Areas with little habitat were less of a concern than areas with suitable habitat to support the receptors of interest.

- Alternate benchmarks: These benchmarks are used to further evaluate risks to specific groups of ecological receptors (e.g., plants, invertebrates).

Summaries of the Step 3a evaluation for terrestrial plants and soil invertebrates are presented in Table 8-5. A detailed discussion of the Step 3a evaluation is presented in the following sections.

8.4.1 Tier 2, Step 3a: Terrestrial Plants

Several PAHs were selected as COPCs because screening levels were not available. An Eco SSL is not available for plants for PAHs; however, data presented on Table 3.1 in the Eco SSL document for PAHs shows that PAHs are typically not toxic to plants except at high soil concentrations with the lowest listed EC_{50} of 30,000 µg/kg (Mitchell et al.,1988). All concentrations of PAHs are well below this value. Also, concentrations for all PAHs are less than the CCME screening value for anthracene of 2,500 µg/kg (CCME, 2010). It does not appear that PAH concentrations in soil are likely to impact plants because all detected concentrations are significantly less than these benchmarks. Therefore, PAHs are not expected to impact plants at the site and are eliminated as COPCs.

Carbazole and dibenzofuran were initially selected as COPCs because screening levels were not available. Carbazole was detected at a maximum concentration of 62 J µg/kg with detections in 6 of 10 samples. Dibenzofuran was detected at a maximum concentration of 15 µg/kg with detections in 3 of 10 samples. Because of the relatively low concentrations, compared to those for the other SVOCs, and/or the low frequency of detection, adverse effects to soil invertebrates from carbazole and dibenzofuran are not expected. Also, because the site is vegetated, it does not appear that plants are being significantly impacted. For these reasons, carbazole and dibenzofuran are eliminated as COPCs for plants.

8.4.2 Tier 2, Step 3a: Soil Invertebrates

Carbazole and dibenzofuran were eliminated as COPCs for soil invertebrates for reasons similar to those presented above.

8.5 ECOLOGICAL RISK UNCERTAINTY ANALYSIS

This section discusses some of the uncertainties associated with the SWMU 29 ERA.

8.5.1 Uncertainty in Assessment Endpoints and Measurement Endpoints

Measurement endpoints were used to evaluate the assessment endpoints selected for the ERA. For the ERA, the measurement endpoints were not the same as the assessment endpoints. Measurement endpoints were used to predict effects to the assessment endpoints by selecting surrogate species to be evaluated. For example, a decrease in reproduction of a shrew was used to assess a decrease in reproduction of the small mammal population. However, predicting a decrease in reproduction of a shrew may either underprotect or overprotect the small mammal population based on differences in ingestion rates, toxicity, food preferences, home ranges, etc. between different species.

As discussed in Section 8.2.1.1, several endangered and threatened species or species of special concern are present at NSA Crane and potentially may inhabit SWMU 29. Risks to these species were not specifically calculated, so the uncertainties of not calculating risks to these species are presented here. Unacceptable risks to the bobcat, bald eagle, northern harrier, and osprey are not expected because habitat is not available. The bobcat has a significantly larger home range. The bald eagle and osprey require open water habitat, which is not available at SWMU 29, but is available in Lake Greenwood located approximately 800 feet from the site. The northern harrier prefers wetlands habitat, which is not available at SWMU 29. However, there is uncertainty with this conclusion because risks were not quantitatively evaluated.

Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American woodcock in the food-chain model. Because worms are in direct contact with soil, it is expected that they would have greater levels of contaminants at SWMU 29 than aboveground insects; therefore, risks to the woodcock from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. By protecting the woodcock, these other invertivorous birds will also be protected. As mentioned in Section 8.2.1.1, the presence of the Indiana bat has not been documented at SWMU 29 and no Indiana bats were captured at the mist net site one mile from SWMU 29.

Finally, there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals. As discussed in Section 8.2.1.1, one threatened reptilian species is listed as potentially present at NSA Crane. Based on the preferred habitat of the timber rattlesnake and the ecology of SWMU 29, this species likely does not inhabit areas of SWMU 29. Risks to carnivorous reptiles were not specifically calculated; however, risks are accounted for by using invertivorous birds and mammals as surrogates.

8.5.2 Uncertainty in Exposure Characterization

The contaminant dose to terrestrial wildlife is calculated using an equation that incorporates ingestion rates, body weights, BAFs, and other exposure factors. The exposure factors were obtained from literature studies or predicted using various equations. Ingestion rates and body weights vary among species, especially among species inhabiting different areas. This was taken into account when selecting exposure parameters from USEPA (USEPA, 1993), and an attempt was made to minimize the uncertainties associated with the exposure characterization by selecting exposure parameters from studies conducted in Indiana and surrounding states.

Bioaccumulation of contaminants into various biological media (e.g., plants, invertebrates, small mammals) depends on characteristics of the media such as pH, organic carbon, etc. Therefore, actual BAFs at the site may be different than those used in the ERA and obtained from the literature. Also, the bioavailability of contaminants reported in toxicity studies is typically greater than the contaminants in environmental media. Typically, highly bioavailable forms of the chemicals are used when conducting toxicity tests and/or conducting dosing studies for wildlife.

There is uncertainty in the chemical data collected at the site. Measured levels of chemicals are only estimates of true site chemical concentrations. At SWMU 29, samples were deliberately biased toward suspected high concentrations by sampling in the location of the former PCP Dip Tank, so predicted doses are probably higher than actual doses. Whereas this is a conservative approach in predicting exposure concentrations, actual exposure of ecological receptors to chemical concentrations at SWMU 29 is likely overestimated. In particular, wildlife that typically roam over multiple sample locations are unlikely to obtain all of their food from within the most contaminated areas at SWMU 29.

Finally, although the overall site boundary encompasses a 1.6 acre area, the potentially impacted area is only 0.05 acres. Therefore, even small mammals and birds would not obtain a significant amount of their food from the impacted area.

8.5.3 Uncertainty in Ecological Effects Data

Uncertainty exists in the ecological effects data, including the screening levels and wildlife TRVs. Several of the screening levels are very conservative, and typically are based on studies where the bioavailability of the chemical is much greater than it is in the environment. Also, toxicity data was not available or was limited for some chemicals.

The NOAELs/LOAELs used for the wildlife endpoints species are based on species other than the endpoint species (e.g., rats, mice). Uncertainty exists in the application of toxicity data across species because the contaminant may be more or less toxic to the endpoint species than it was to the test study species.

8.5.4 Uncertainty in Risk Characterization

Risks are possible if an EEQ is greater than or equal to 1.0 regardless of the magnitude of the EEQ. However, the magnitude of effects to ecological receptors cannot be inferred based on the magnitude of the EEQ. Rather, an EEQ greater than 1.0 simply indicates that the dose used to derive the toxicity reference value was exceeded.

Finally, there is uncertainty in how the predicted risks to a species at a site translate into risk to the population in the area as a whole.

8.6 ECOLOGICAL RISK SUMMARY AND CONCLUSIONS

This ERA evaluated surface soil from SWMU 29. Based on the initial screening of the chemical data, several chemicals were initially selected as COPCs in surface soil because they did not have screening levels.

These chemicals were then further evaluated to refine the list of COPCs, and to better characterize risks to ecological receptors. The following presents the results of the ERA.

8.6.1 Terrestrial Plants and Soil Invertebrates

No chemicals were retained as a COPC for potential risks to terrestrial plants and soil invertebrates.

8.6.2 Mammals and Birds

No chemicals were retained as COPCs for mammals and birds.

TABLE 8-1

ASSESSMENT ENDPOINTS AND MEASUREMENT ENDPOINTS
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Assessment Endpoint	Measurement Endpoint
Adverse effects on the survival, reproduction, and/or growth of soil invertebrates	• Survival, growth, and/or reproduction of soil invertebrates were evaluated by comparing the measured concentrations of chemicals in the surface soil to invertebrate soil screening levels.
Adverse effects on the survival, reproduction, and/or growth of terrestrial plants	• Survival, growth, and/or reproduction of terrestrial plants were evaluated by comparing the measured concentrations of chemicals in the surface soil to plant soil screening levels.
Adverse effects on the survival, reproduction, and/or increase in development effects of invertivorous birds	• Survival, reproduction, and/or increase in development effects of birds were evaluated by comparing the estimated ingested dose of contaminants in the surface soil and earthworms to No Observed Adverse Effects Levels (NOAELs) and Lowest Observed Adverse Effects Levels (LOAELs) for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of invertivorous mammals	• Survival, reproduction, and/or increase in development effects of mammals were evaluated by comparing the estimated ingested dose of contaminants in the surface soil and earthworms to NOAELs and LOAELs for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of herbivorous birds	• Survival, reproduction, and/or increase in development effects of birds were evaluated by comparing the estimated ingested dose of contaminants in the surface soil and plants to NOAELs and LOAELs for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of herbivorous mammals	• Survival, reproduction, and/or increase in development effects of mammals will be evaluated by comparing the estimated ingested dose of contaminants in the surface soil and plants to NOAELs and LOAELs for surrogate wildlife species.

TABLE 8-2

SOIL SCREENING LEVELS
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Parameter	Ecological Soil Screening Level							
	Plant		Invertebrate		Avian		Mammal	
	Value	Source	Value	Source	Value	Source	Value	Source
SEMIVOLATILES (UG/KG)								
ACENAPHTHENE	20000	ORNL	29000	Eco SSL	NA	NA	100000	Eco SSL
ANTHRACENE	2500	CCME	29000	Eco SSL	NA	NA	100000	Eco SSL
BENZO(A)ANTHRACENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
BENZO(A)PYRENE	20000	CCME	18000	Eco SSL	NA	NA	1100	Eco SSL
BENZO(B)FLUORANTHENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
BENZO(G,H,I)PERYLENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
BENZO(K)FLUORANTHENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
CARBAZOLE	NA	NA	NA	NA	NA	NA	NA	NA
CHRYSENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
DIBENZO(A,H)ANTHRACENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
DIBENZOFURAN	NA	NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	50000	CCME	29000	Eco SSL	NA	NA	100000	Eco SSL
FLUORENE	NA	NA	29000	Eco SSL	NA	NA	100000	Eco SSL
INDENO(1,2,3-CD)PYRENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
PHENANTHRENE	NA	NA	29000	Eco SSL	NA	NA	100000	Eco SSL
PYRENE	NA	NA	18000	Eco SSL	NA	NA	1100	Eco SSL
PETROLEUM HYDROCARBONS (UG/KG)								
DRO (C08-C28)	NA	NA	NA	NA	NA	NA	NA	NA

Ecological Screening Level sources used in the order of preference:
EcoSSL - EPA Ecological Soil Screening Levels (USEPA, 2007b)
Region 5 - USEPA Region 5 Ecological Screening Levels (USEPA, 2003).
CCME - Canadian Soil Quality Guidelines (CCME, 2010)
ORNL - Oak Ridge National Laboratory Toxicological Benchmarks for plants (Efroymson et al., 1997a)

NA - Not available.

TABLE 8-3

SURFACE SOIL COPC SELECTION
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Sample of Maximum Detection	Averge of Positive Concentrations[1]	Average of All Results[2]	Ecological Screening Level[3]				Ecological Effects Quotient[4]				Deletion or Selection of COPCs for Invertebrates/Plants		Further Evaluated in Terrestrial Food Chain Modeling[5]	
							Plant	Invertebrate	Avian	Mammal	Plant	Invertebrate	Avian	Mammal	COPC (yes/no)?	Rationale	Evaluated (yes/no)?	Rationale
SEMIVOLATILES (UG/KG)																		
ACENAPHTHENE	5/10	7.3 J	36	29SS0020004	22.9	16.0	20000	29000	NA	100000	0.0018	0.0012	NA	0.00036	NO	BSL	YES	NSL
ANTHRACENE	6/10	9.7 J	75	29SS0020004	38.8	26.9	2500	29000	NA	100000	0.030	0.0026	NA	0.00075	NO	BSL	YES	NSL
BENZO(A)ANTHRACENE	10/10	11 J	280	29SS0020004	85.4	85.4	NA	18000	NA	1100	NA	0.016	NA	0.25	YES	NSL	YES	NSL
BENZO(A)PYRENE	10/10	7.3 J	320	29SS0020004	89.3	89.3	20000	18000	NA	1100	0.016	0.018	NA	0.29	NO	BSL	YES	NSL
BENZO(B)FLUORANTHENE	10/10	15 J	500	29SS0020004	154	154	NA	18000	NA	1100	NA	0.028	NA	0.45	YES	NSL	YES	NSL
BENZO(G,H,I)PERYLENE	9/10	36 J	180	29SS0020004	76.8	70.0	NA	18000	NA	1100	NA	0.010	NA	0.16	YES	NSL	YES	NSL
BENZO(K)FLUORANTHENE	9/10	28 J	150	29SS0020004	65.9	60.2	NA	18000	NA	1100	NA	0.0083	NA	0.14	YES	NSL	YES	NSL
CARBAZOLE	6/10	12 J	62 J	29SS0020004	29.2	21.2	NA	NA	NA	NA	NA	NA	NA	NA	YES	NSL	NO	NONBIO
CHRYSENE	10/10	8 J	320	29SS0020004	99.9	99.9	NA	18000	NA	1100	NA	0.018	NA	0.29	YES	NSL	YES	NSL
DIBENZO(A,H)ANTHRACENE	3/10	24 J	52 J	29SS0020004	33.3	14.3	NA	18000	NA	1100	NA	0.0029	NA	0.047	YES	NSL	YES	NSL
DIBENZOFURAN	3/10	10 J	15 J	29SS0080004	12.7	10.1	NA	NA	NA	NA	NA	NA	NA	NA	YES	NSL	NO	NONBIO
FLUORANTHENE	10/10	20 J	540	29SS0020004	153	153	50000	29000	NA	100000	0.011	0.019	NA	0.0054	NO	BSL	YES	NSL
FLUORENE	4/10	8.1 J	28 J	29SS0080004	19.8	13.3	NA	29000	NA	100000	NA	0.0010	NA	0.00028	YES	NSL	YES	NSL
INDENO(1,2,3-CD)PYRENE	9/10	31 J	150	29SS0020004	59.8	55.6	NA	18000	NA	1100	NA	0.0083	NA	0.14	YES	NSL	YES	NSL
PHENANTHRENE	10/10	7.3 J	390	29SS0020004	124	124	NA	29000	NA	100000	NA	0.013	NA	0.0039	YES	NSL	YES	NSL
PYRENE	10/10	10 J	1100	29SS0020004	307	307	NA	18000	NA	1100	NA	0.061	NA	1.0	YES	NSL	YES	NSL
PETROLEUM HYDROCARBONS (UG/KG)																		
DRO (C08-C28)	7/10	3700 J	45000 J	29SS0090004	14186	10480	NA	NA	NA	NA	NA	NA	NA	NA	NO	(6)	NO	(6)

Ecological effects quotients are shaded if the maximum detected concentration exceeds a screening level or a screening level is not available. Other cells are shaded if the chemical is retained as a COPC for plants or invertebrates or if the chemical is retained for food chain modeling.

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - Sources of ecological screening levels are presented in Table 8-2.
4 - Ecological Effects Quotients (EEQs) were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
5 - Chemicals with EEQs for birds or mammals greater than 1.0 or bioaccumulative chemicals without bird or mammal screening values are retained for food chain modeling.
6 - DRO is not selected as a COPC because risks from DRO are evaluated indirectly by evaluating risks from the individual PAHs.

COPC Selection Rationale:

BSL = Below Screening Level
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level

TABLE 8-4

TERRESTRIAL FOOD CHAIN MODEL - TIER 1 SCENARIO
INVERTIVOROUS AND HERBIVOROUS RECEPTORS
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		Woodcock		Short-Tailed Shrew	
Chemical	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
SEMIVOLATILES								
ACENAPHTHENE	3.6E-03	3.6E-04	6.0E-05	1.1E-05	5.4E-03	5.4E-04	1.4E-04	2.6E-05
ANTHRACENE	3.0E-03	3.0E-04	4.6E-05	8.5E-06	1.8E-02	1.8E-03	4.8E-04	8.8E-05
BENZO(A)ANTHRACENE	3.6E-03	3.6E-04	3.8E-03	6.1E-05	4.5E-02	4.5E-03	1.3E-01	2.0E-03
BENZO(A)PYRENE	4.4E-03	4.4E-04	4.9E-03	7.9E-05	4.4E-02	4.4E-03	1.2E-01	1.9E-03
BENZO(B)FLUORANTHENE	1.1E-02	1.1E-03	1.6E-02	2.6E-04	1.3E-01	1.3E-02	3.6E-01	5.8E-03
BENZO(G,H,I)PERYLENE	3.9E-03	3.9E-04	5.5E-03	8.8E-05	5.1E-02	5.1E-03	1.5E-01	2.4E-03
BENZO(K)FLUORANTHENE	2.2E-03	2.2E-04	2.6E-03	4.2E-05	3.8E-02	3.8E-03	1.1E-01	1.7E-03
CHRYSENE	4.0E-03	4.0E-04	4.2E-03	6.7E-05	7.2E-02	7.2E-03	2.1E-01	3.3E-03
DIBENZO(A,H)ANTHRACENE	7.1E-04	7.1E-05	8.0E-04	1.3E-05	1.2E-02	1.2E-03	3.4E-02	5.4E-04
FLUORANTHENE	1.7E-02	1.7E-03	2.6E-04	4.7E-05	1.6E-01	1.6E-02	4.3E-03	7.9E-04
FLUORENE	4.3E-03	4.3E-04	7.4E-05	1.4E-05	2.5E-02	2.5E-03	7.0E-04	1.3E-04
INDENO(1,2,3-CD)PYRENE	1.9E-03	1.9E-04	2.0E-03	3.2E-05	4.1E-02	4.1E-03	1.2E-01	1.9E-03
PHENANTHRENE	2.7E-02	2.7E-03	4.3E-04	7.9E-05	6.7E-02	6.7E-03	1.8E-03	3.3E-04
PYRENE	4.8E-02	4.8E-03	7.8E-02	1.3E-03	1.9E-01	1.9E-02	5.4E-01	8.7E-03

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE 8-5

STEP 3A EVALUATION FOR RISKS TO PLANTS AND INVERTEBRATES
SURFACE SOIL COPCs
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern (COPC)	Frequency of Detection	Maximum Detected Concentration	Screening Level[1]		Maximum EEQ[2]		Step 3a Evaluation[3]				Risk Determination (Acceptable/ Unacceptable)	Retained as a COPC?	
							Alternate Benchmark		Step 3a Factors Considered in Evaluation				
			Plants	Invertebrates	Plants	Invertebrates	Value	Source	Plants	Invertebrates		Plants	Invertebrates
SVOC (ug/kg)													
BENZO(A)ANTHRACENE	10/10	280	NA	18000	NA	0.016	NA	NA	Maximum concentration less than benchmarks for other PAHs.	Not a COPC for invertebrates.	Acceptable	No	No
BENZO(B)FLUORANTHENE	10/10	500	NA	18000	NA	0.028	NA	NA			Acceptable	No	No
BENZO(G,H,I)PERYLENE	9/10	180	NA	18000	NA	0.010	NA	NA			Acceptable	No	No
BENZO(K)FLUORANTHENE	9/10	150	NA	18000	NA	0.0083	NA	NA			Acceptable	No	No
CARBAZOLE	6/10	62	NA	NA	NA	NA	NA	NA	Low concentration compared to benchmarks for plants and invertebrates for other SVOCs.		Acceptable	No	No
CHRYSENE	10/10	320	NA	18000	NA	0.018	NA	NA	Maximum concentration less than benchmarks for other PAHs.	Not a COPC for invertebrates.	Acceptable	No	No
DIBENZO(A,H)ANTHRACENE	3/10	52	NA	18000	NA	0.0029	NA	NA			Acceptable	No	No
DIBENZOFURAN	3/10	15	NA	NA	NA	NA	NA	NA	Low concentration compared to benchmarks for plants and invertebrates for other SVOCs. Also, relatively low frequency of detection		Acceptable	No	No
FLUORENE	4/10	28	NA	29000	NA	0.0010	NA	NA	Maximum concentration less than benchmarks for other PAHs.	Not a COPC for invertebrates.	Acceptable	No	No
INDENO(1,2,3-CD)PYRENE	9/10	150	NA	18000	NA	0.0083	NA	NA			Acceptable	No	No
PHENANTHRENE	10/10	390	NA	29000	NA	0.013	NA	NA			Acceptable	No	No
PYRENE	10/10	1100	NA	18000	NA	0.061	NA	NA			Acceptable	No	No

Footnotes:

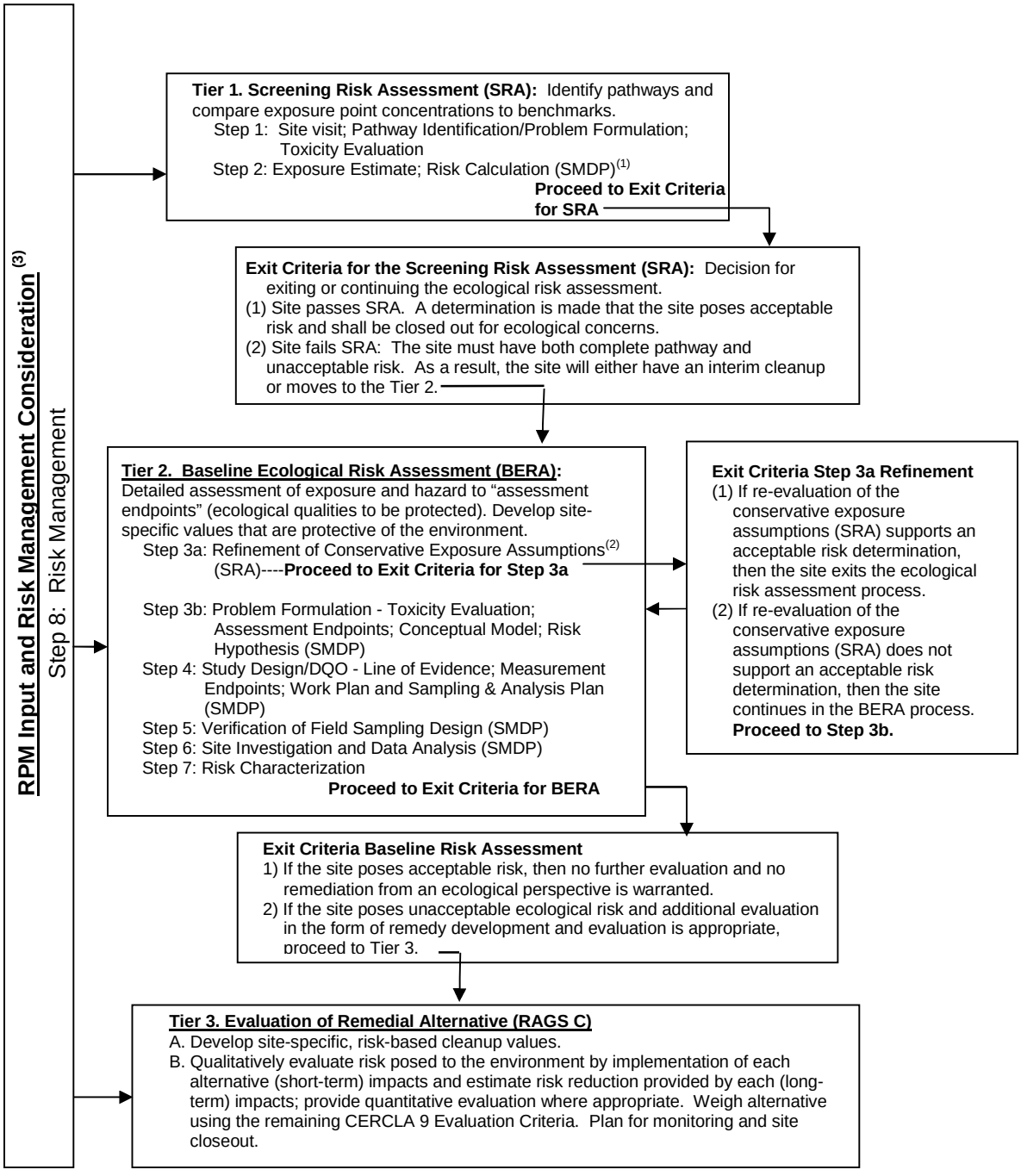
1 Sources of ecological screening levels presented in Table 8-2.
2 Maximum detection divided by screening level.
3 See Section 8.4 for a more detailed Step 3a evaluation.

Acronyms:

COPC = Chemical of Potential Concern
EEQ = Ecological Effects Quotient
NA = Not Available or Not Applicable

FIGURE 8-1

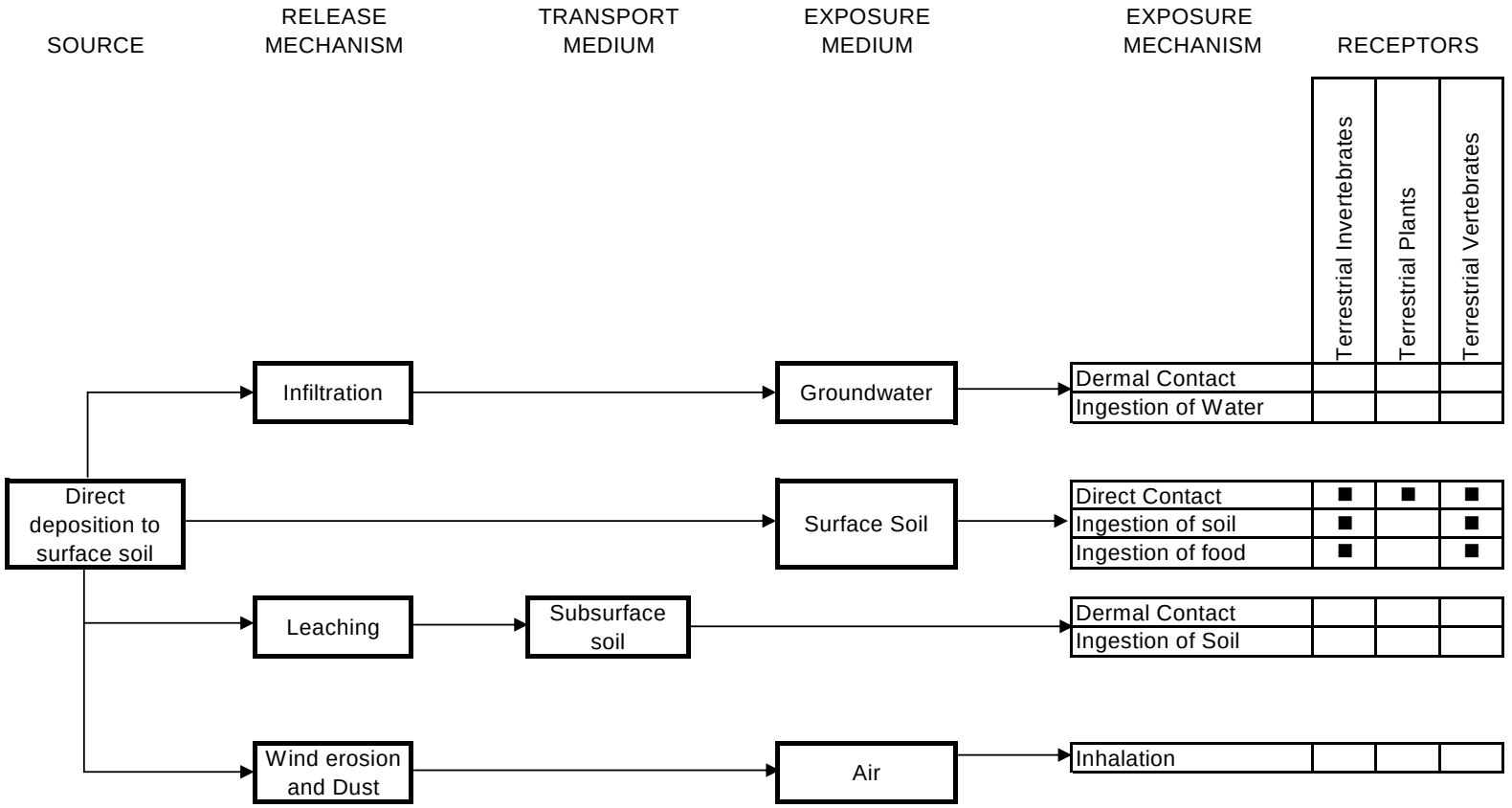
NAVY ECOLOGICAL RISK ASSESSMENT TIERED APPROACH
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA



Notes: 1 See USEPA's 8 Steps ERA Process for requirements for each Scientific Management Decision Point (SMDP).
2 Refinement includes but is not limited to background, bioavailability, detection frequency, etc.
3 Risk management is incorporated throughout the tiered approach.

FIGURE 8-2

ECOLOGICAL CONCEPTUAL SITE MODEL
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA



Blank space indicates incomplete exposure pathway or relatively insignificant or not applicable potential exposure.

REFERENCES

Army, 1978. Installation Assessment of the NSWC Crane, Record of Evaluation Report No. 117. Aberdeen Proving Ground, Maryland, March.

A.T. Kearney, Inc., 1987. Preliminary Review/Visual Inspection Report of Naval Weapons Support Center, Crane, Indiana, EPA Contract No. 68- 01-7038, Work Assignment R05-02-45, March.

ATSDR (Agency for Toxic Substances and Disease Registry), 1995. Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs). Atlanta, GA: U.S. Department of Health and Human Services. http://www.atsdr.cdc.gov/toxprofiles/tp69.pdf

ATSDR, 2001. Toxicological Profile for Pentachlorophenol.

CCME (Canadian Council of Ministers of the Environment). 2010. Canadian soil quality guidelines for the Protection of Environmental and Human Health: Carcinogenic and Other PAHs. Updated In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environmental, Winnipeg.

Comarco Systems, Inc., 2000. Endangered Species Management Plan for the Crane Division, Naval Surface Warfare Center. October.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory. November. ES/ER/TM-85/R3.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory. November. ES/ER/TM-126/R2.

ESI (Environmental Solutions and Innovations, Inc.), 2005. 2005 Summer Mist Net Survey for Bats at the Naval Support Activity, Crane, Indiana. December.

Extoxnet, 2011. Internet download from http://extoxnet.orst.edu/pips/pentachl.htm,January 5.

Halliburton NUS, 1992a. RFI Phase I, Environmental Monitoring Report, SWMUs 19/00, 08/17. 12/14, 13/14. Navy Northern Division, CTO 15, August.

Halliburton NUS, 1992b. RFI Phase I, Environmental Monitoring Report, SWMUs 15/06, 14/10, 16/16, NorthDiv, CTO 15, November.

IDEM (Indiana Department of Environmental Management), 2009. Risk Integrated System of Closure Users Guide and Technical Resource Guidance Document. Indiana Department of Environmental Management, http://www.in.gov/idem/programs/land/risc/, Updated May 1 2009.

Naval Energy and Environmental Support Activity, 1983. Initial Assessment Study of Naval Weapons Support Center, Navy Assessment and Control of Installation Pollutants, Crane, Indiana, NEESA 13-003, Naval Energy and Environmental Support Activity, Port Hueneme. California 93043, May.

Navy (Department of Navy), 1997. Environmental Policy Memorandum 97-04: Use of Ecological Risk Assessments. May 16.

Navy, 1999. Navy Policy For Conducting Ecological Risk Assessments. Memo from Chief of Naval Operations to Commander, Naval Facilities Engineering Command. Department of the Navy, Washington, DC, April 5.

Navy, 2001. Conducting Human Health Risk Assessments Under the Environmental Restoration Program, Chief of Naval Operations (N45) 5090 Ser N453E/1U595168.

Navy, 2004. Navy Policy on the Use of Chemical Background Levels, Ser N 45C/N4U732212, Washington, D.C.

Navy, 2008. U.S. Navy Human Health Risk Assessment Guidance.

NEESA (Naval Energy and Environmental Support Activity), 1983. Initial Assessment Study of Naval Weapons Support Center, Crane, Indiana. NEESA 13-003, May.

Smith, Robert L., 1966. Ecology and Field Biology. Harper and Row, Publishers, Inc.

Tetra Tech, NUS, Inc., 2001. Basewide Background Soil Investigation Report. Naval Surface Warfare Center, Crane, Indiana, January.

Tetra Tech, NUS, Inc., 2011. Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan). Naval Surface Warfare Center, Crane, Indiana, June.

USEPA (United States Environmental Protection Agency), 1989. Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002, Office of Emergency and Remedial Response, Washington, D.C.

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Directive 9285.6-03, Office of Solid Waste and Emergency Response, Washington, D.C.

USEPA, 1992. "Guidance and Risk Characterization for Risk Managers and Risk Assessors." Memorandum from F. Henry Habicht, Deputy Administrator, Washington, D.C.

USEPA, 1993a. Wildlife Exposure Factors Handbook. EPA/600/R-93/187a. Office of Research and Development. Washington, DC, 1993.

USEPA, 1993b. Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Office of Solid Waste and Emergency Response, Washington, D.C.

USEPA, 1994. RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects. June.

USEPA, 1997a. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. Environmental Response Team, June 5.

USEPA, 1997b. Health Effects Assessment Summary Tables FY 1997. Office of Solid Waste and Emergency Response, Washington, D.C.

USEPA, 1997c. Exposure Factors Handbook. EPA/600/P-95/002Ba, National Center for Environmental Assessment, Washington, D.C.

USEPA, 1998. Final Guidelines for Ecological Risk Assessment. Risk Assessment Forum, Washington, DC, EPA/630/R095/002F. April.

USEPA, 1999. Contract Laboratory Program National Functional Guidelines for Organics Data Review. EPA540/R-99/008. Office of Emergency and Remedial Response, Washington, DC. October.

USEPA, 2001. Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments).

USEPA, 2002a. Guidance for Characterizing Background Chemicals in Soil at Superfund Sites. Office of Solid Waste and Emergency Response and Office of Emergency and Remedial Response, EPA/540/R-01/003. OSWER 9285.7-41.

USEPA, 2002b. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. Office of Emergency and Remedial Response. OSWER Publication No. 9285.6-10.

USEPA, 2002c. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2003a. Ecological Screening Levels. USEPA Region 5. http://www.epa.gov/reg5rcra/ca/edql.htm. August.

USEPA, 2003b. Human Health Toxicity Values in Superfund Risk Assessments. Office of Superfund Remediation and Technology Innovation, OSWER 9285.7-53, Washington, DC.

USEPA, 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005, Office of Emergency and Remedial Response, Washington, D.C.

USEPA, 2005a. Guidance for Developing Ecological Soil Screening Levels. Office of Solid Waste and Emergency and Response. OSWER Directive 92857-55. February.

USEPA, 2005b. Guidelines for Carcinogenic Risk Assessment. EPA/630/P-03/001B. Risk Assessment Forum. Washington, DC.

USEPA, 2005c. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. Risk Assessment Forum. Washington, DC.

USEPA, 2007a. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

USEPA, 2007b. Ecological Soil Screening Level for PAHs, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-78. June.

USEPA, 2009. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. Office of Superfund Remediation and Technology Innovation, Washington, D.C. 20460 EPA-540-R-070-002, OSWER 9285.7-82.

USEPA, 2010. ProUCL Version 4.1 User Guide. Office of Research and Development, Washington, D.C. EPA/600/R-07/041, May.

USEPA, 2011. Residential Regional Screening Levels for Chemical Contaminants in Soil at Superfund Sites developed by Oak Ridge National Laboratory (ORNL). www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm, November.

APPENDIX A

SWMU 29 PHOTOGRAPHS

Figure 1. Assumed location of the SWMU 29 Former PCP Dip Tank.

Figure 2. Looking southeast up hillside toward the location of the former PCP Dip Tank.

Figure 3. Looking west-southwest on hillside below the location of the former SWMU 29 PCP Dip Tank.

Figure 4. Looking south-southwest up hillside toward the location of the former SWMU 29 PCP Dip Tank.

APPENDIX B

SWMU 29 FIELD FORMS

APPENDIX B.1

SWMU 29

BORING AND SOIL LOG SHEETS

SWMU 29 – SOIL LOGS

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU29
PROJECT NUMBER: 112G03137
DRILLING COMPANY: Micah
DRILLING RIG: DPT-AMS95

BORING No.: 29SB01
DATE: 7-13-11
GEOLOGIST: E. Bentlite
DRILLER: G-Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**
X	0		90%			White Brown	Topsoil 1st 6"	I					
X	1		1				Gravel Fill	Fill					
X	2		1			tan	V. Fine sandy clay	CL	Bedrock pieces				
	3						Refusal at 3'						
	4												
	5												
	6												
	7												
	8												
	9												
	10												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112G03137
DRILLING COMPANY: Micah
DRILLING RIG: DPT-AMS 95

BORING No.: 29SB02
DATE: 7-13-11
GEOLOGIST: E. Berkithe
DRILLER: Micah

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0		30#		Loose	Black White	Dry Asphalt Gravel Fill	Fill					
	1		↓				↓	↓					
	2												
	3		↓										
	4		50#		Dense	tan	V. Fine Sandy Clay	CL					
	5		↑		Loose	Red tan	V. Fine Clayey Sand	SC					
	6		↓				Auger Refusal 6'						
	7												
	8												
	9												
	10												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112031.37
DRILLING COMPANY: Mich
DRILLING RIG: DPT-AMP95

BORING No.: SB03
DATE: 7-13-04
GEOLOGIST: E. Bertlitte
DRILLER: G. Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0		30#			White	Gravel - Fill	FILL					
	1												
	2												
	3												
X	4					Brown	V. Fine Sand Clay	CL	Brown-Tan				
X	5		4				Well-graded Fine Sand	SW	Brown-Moist				
	6		30#				Refusal at 5.5'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112G03137
DRILLING COMPANY: Micah
DRILLING RIG: DPT-AMS 95

BORING No.: SB04
DATE: 4-13-11
GEOLOGIST: E. Berkline
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
X	0		3.0'		Loose	Black	Asphalted Gravel with Fill Material	Fill					
X	1												
X	2												
X	3												
	4						Auger Refusal (3.5')		2nd DPT push got to 4.5 - Still Fill Material				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112603137
DRILLING COMPANY: Micah
DRILLING RIG: DPT JAMS 05

BORING No.: 29 SB 05
DATE: 7-13-11
GEOLOGIST: E. Bertotte
DRILLER: G. Stuhr

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0		20#		Loose	Black	Gravel/Asphalt Fill	Fill					
	1					White							
	2												
	3				Dense	Brown	V. Fine Sandy Clay	CL					
	4					Tan/Red	V. Fine Clayey Sand	SC					
	5		36#										
	6						Auger Refusal at 5.8'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112.G.3137
DRILLING COMPANY: MTGH
DRILLING RIG: DPT-AMS95

BORING No.: 29SB06
DATE: 7-13-11
GEOLOGIST: E. Bentkiste
DRILLER: G. Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**
0	X		30P		Dry/hard	Black	Asphalt + fill	Fill					
1	X		↓		Hard, Dense	tan/ Red	V. Fine Sandy Clay	CL					
2	X		↓		↓	↓	↓	↓					
3	X		↓		↓	↓	↓	↓					
4	X		↓		↓	↓	↓	↓					
5	X		30P		↓	↓	w/Bedrock pieces	↓					
6			↓		↓	↓	↓	↓					
7							Auger Refusal-Bedrock (6.5')						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No ____ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112G03137
DRILLING COMPANY: Micah
DRILLING RIG: AMS 95-DPT

BORING No.: 29 SB07
DATE: 7-13-4
GEOLOGIST: E. Berthelot
DRILLER: G. Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
X	0		90%			Brown	Fill and topsoil	Fill					
X	1					Tan	Lt. Fine Sandy Clay	CL					
	2		90%				Bedrock pieces						
	3						Refusal at 3.3'						
	4												
	5												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112G3137
DRILLING COMPANY: Micah
DRILLING RIG: DPT-AMS 95

BORING No.: 29SB08
DATE: 7-13-11
GEOLOGIST: E. Bertolette
DRILLER: G. Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0		60"		Loose	White	Gravel Fill - Dry	Fill					
	1												
	2												
	3												
	4				Loose	Loose	Moist Well graded Sand (Brown)	SW					
	5						Auger Refusal at 5.5'						
	6												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112G03137
DRILLING COMPANY: Michael
DRILLING RIG: DPT - AMS 45

BORING No.: 29SB09
DATE: 7-13-11
GEOLOGIST: E. Berthe
DRILLER: G. Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0		50#		Loose	Black	Asphalt + gravel	Fill					
	1		↓		↓	White	Fill	↓					
	2					↓	↓						
	3				↓								
	4		↓		Dense	Brown	V. Fine Sandy Clay	CL	Dry				
	5		30#			↓	V. Fine Clay Sand	SC	→ Dry				
	6						Auger Refusal at 5.7	↓					
	7												
	8												
	9												
	10												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ☐

Remarks: _____

Converted to Well: Yes ____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112G03137
DRILLING COMPANY: Micah
DRILLING RIG: DPT

BORING No.: DPSB10
DATE: 7-13-11
GEOLOGIST: E. Bertlitte
DRILLER: G. Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
X	0		60"		Loose	White Brown	Gravel / Fill	Fill					
X	1												
X	2				Dense	Red Brown	Dry V. Fine Sandy Clay	CL					
X	3												
	4						Refusal at 4-						
	5												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: SWMU 29
PROJECT NUMBER: 112C3137
DRILLING COMPANY: Micah
DRILLING RIG: AMS 95 - DPT

BORING No.: 29SB11
DATE: 7-13-11
GEOLOGIST: E. Bertette
DRILLER: G. Stone

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**
X	0		50#		Loose	White	Gravel + topsoil	Fill					
X	1		↕			Brown	↕	↕					
X	2		↕		dense	Tan-Red.	V. Fine Sandy Clay	CL					
	3						Auger Refusal at 2.7'						
	4												
	5												
	6												
	7												
	8												
	9												
	10												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112G03137

Sample ID No.: 295B01
Sample Location:
Sampled By: E. Berktite
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other: 295S001 0002
[ ] QA Sample Type: 295B001 0203

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1530	0-6"	Brown	Topsoil
Method: DPT	6"-2'	White	Gravel-Fill
Monitor Reading (ppm): 0			

~~COMPOSITE SAMPLE DATA:~~ Subsurface

Date: 7-13-11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method: DPT	1540	2-3'	tan	V. fine sandy Clay
Monitor Readings (Range in ppm): 0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Ellen Berktite

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112603137

Sample ID No.: 29SB02
Sample Location:
Sampled By: E. Berkhite
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type: 29SB002004 / 29SB002004D

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11 / Time: 1420 / Method: DPT / Monitor Reading (ppm): 0.5	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0-3.5'	Black/White	Asphalt Gravel Fill

COMPOSITE SAMPLE DATA: Subsurface

Date: 7-13-11 / Method: DPT / Monitor Readings (Range in ppm): 0.5	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	1430	3.5-6'	Tan-Red	V. Fine Sandy Clay → Clayey Sand (Bedrock grass)

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD ✓ | Duplicate ID No.:

Signature(s): Ellen Berkhite

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112G03637

Sample ID No.: 29SB03
Sample Location:
Sampled By: E. Berkhite
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type: 29SB030406

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11
Time: 1525
Method: DPT
Monitor Reading (ppm): 0

Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
0-4'	White	Gravel – Could not Sample

COMPOSITE SAMPLE DATA: Subsurface

Date: 7-13-11
Method: DPT
Monitor Readings (Range in ppm): 0

Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
1525	4-5'	Brown/Tan	Vi Fine Sandy clay – dry
	5-5.6	Brown	well graded sand – moist

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Allen Berkhite

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: JWHL 29
Project No.: 112603137

Sample ID No.: 29SB04
Sample Location:
Sampled By: E. Berktite
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type:

29SS004 0004

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1320	0-4'	Black/White	Asphalt + Gravel Fill
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	~~1330~~	~~02-06'~~		
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Ellen Berktite

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112G03137

Sample ID No.: 295B0005
Sample Location:
Sampled By: E. Berktite
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other: 295S005 0004
[ ] QA Sample Type: 295B005 0406

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1435	0-3.5	Black/White	Asphalt Fill - Gravel
Method: DPT			
Monitor Reading (ppm): 0.5			

~~COMPOSITE SAMPLE DATA:~~ SUBSURFACE

Date: 7-13-11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method: DPT	1445	3.5-4.5	Brown	V. Fine Sandy Clay
		4.5-5.8	Red/Tan	V. Fine Clayey Sand (Bedrock pieces)
Monitor Readings (Range in ppm): 0.8				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Ellen Berktite

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29 - Crane
Project No.: 112603137

Sample ID No.: 29SB06
Sample Location:
Sampled By: E. Berkstresser
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other: 29SS006 0002
[ ] QA Sample Type: 29SB006 0206

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1300	0-2'	0-1 Black	Asphalt
Method: DPT		0-2 Tan-Red	V. Fine Sandy Clay - moist
Monitor Reading (ppm): 0			

~~COMPOSITE SAMPLE DATA:~~ Subsurface

Date: 7-13-11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method: 1310	1310	2-6.5'	Tan/Red	V. Fine Sandy Clay - Moist
Monitor Readings (Range in ppm): 0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: 29FD071311-02

Signature(s): Ellen Berkstresser

2-6

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112603137

Sample ID No.: 295B07
Sample Location:
Sampled By: E. Berkhite
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type: 295S007 0002

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1550	0-1.5	White/Brown	Topsoil and Gravel
Method: DPT			
Monitor Reading (ppm): 0			

~~COMPOSITE SAMPLE DATA:~~ SUBSURFACE

Date: 7-13-11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method: DPT	1600	1.5-3.3'	Tan	Dry, V. Fine Sandy Clay w/Bedrock pieces (Not enough sample for collection at 2-3')
Monitor Readings (Range in ppm): 0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):
Ellen Berkhite

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112603137

Sample ID No.: 29SB08
Sample Location:
Sampled By: E. Bertlite
C.O.C. No.:

- [X] Surface Soil
- [X] Subsurface Soil
- [ ] Sediment
- [ ] Other: 29SS008 0004
- [ ] QA Sample Type: 29SB008 0406

Type of Sample:
- [ ] Low Concentration
- [ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11 / Time: 1500 / Method: DPT / Monitor Reading (ppm): 0.6	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0-4'	White	Gravel Fill

COMPOSITE SAMPLE DATA:

Date: 7-13-11 / Method: DPT ~~1510~~ / Monitor Readings (Range in ppm): 0.6	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	1510	4-5.5'	Brown	Moist, well graded Sand

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Ellen Bertlite

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112G03137

Sample ID No.: 29SB09
Sample Location:
Sampled By: E. Berkstresser
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other: 29SS09 0004
[ ] QA Sample Type: 29SB09 0406

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1705	0-4	Black/White	Asphalt/Gravel Fill
Method: DPT			
Monitor Reading (ppm): 0.3			

~~COMPOSITE SAMPLE DATA:~~ SB Surface

Date: 7-13-11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method: DPT	1715	4-5.7'	Red/Tan	4-5' Sandy Clay - Dry
				5-5.7 Clayey Sand (Bedrock pieces)
Monitor Readings (Range in ppm): 0.3				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Ellen Berkstresser

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112G0313.7

Sample ID No.: 295B10
Sample Location:
Sampled By: E. Berkhite
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type: 295S010 0002 / 295B010a204

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11 / Time: 1630 / Method: PPT / Monitor Reading (ppm): 0	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0-2.5'	White	Gravel Fill

COMPOSITE SAMPLE DATA:

Date: 7-13-11 / Method: PPT / Monitor Readings (Range in ppm): 0

Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
1635	2.5-4'	Red-Tan	Dry, V. Fine Sandy Clay

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: FD071311-01

Signature(s): Ellen Berkhite

~~X FD071311-02 X~~ - Not enough sample for FD Switched to SB06

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SWMU 29
Project No.: 112G03134

Sample ID No.: 29SB11
Sample Location:
Sampled By: E. Berkstresser
C.O.C. No.:

[X] Surface Soil
[X] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type: 29SS011 0002 / 29SB011 0203

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date: 7-13-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1610	0-2'	Brown/Mottled	Gravel - Topsoil
Method: DPT			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date: 7-13-11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method: DPT	1615	2-2.7'	Tan-Red	V. Fine Sandy Clay - Dry
Monitor Readings (Range in ppm): 0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.: FD011311

Signature(s): Ellen Berkstresser

APPENDIX B.2

SWMU 29

FIELD NOTES

NSA CRANE
SWMU 29 PCP DIP TANK
FIELD NOTES

- Sampling conducted on July 13, 2011
- Reviewed SAP and presented an overview of field activities to field team and subcontractor.
- Utilities locations were marked at the site. Proceeded to marked sample locations. Located soil boring locations SB01, SB03, SB04, SB05, SB06 (asphalt) SB07, and SB10 as planned in SAP. Had to relocate other boring locations (SB02, SB08, SB09 and SB11 due either to the present of overhead power lines in vicinity of the driller or underground utilities.

    - SB02 moved approximately 6 feet due south because of overhead power lines
    - SB08 moved approximately 3 feet south because of overhead power lines
    - SB09 moved approximately 7 feet southeast because of overhead power lines and
    - underground utilities.
    - SB11 moved 2 feet east because of overhead power lines

- An examination of soil borings indicated that the soil beneath the surface consists of fill material and was observed at all soil boring locations. The surface soil sample depth varied from 0 to about 4 feet bgs, depending on the fill material content. The subsurface soil samples included the depth just beneath the fill material to bedrock refusal (deepest being 6.5 feet bgs at 29SB006). The subsurface soil appears to be a mixture of sand, silt, and clay.

APPENDIX B.3

SWMU 29

CALIBRATION LOGS

SWMU 29 CALIBRATION LOGS

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: *SWMU ~~16 & 25~~ 25+29 NSA Crane, Indiana* **PROJECT NO.:** 1126031116 / 1126031137

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		
7/11/11	MultiRae Plus	095-520503	Kevin			oxy 20.9	oxy 20.9		
						CO 48.0	CO 49.0		
						H_2S 22.0	H_2S 24.0		
7/13/11	MultiRae Plus	095-520503	E. Berktite			oxy 20.9	oxy 24		
						CO ~~40~~ 48.0	48		
						H_2S 22.0	22		

APPENDIX B.4

SWMU 29

CHAIN OF CUSTODY

CAPE FEAR

TETRA TECH NUS, INC. | **CHAIN OF CUSTODY** | **NUMBER** NJ 0357 | **PAGE** 1 **OF** _____

PROJECT NO: 112G03137	**FACILITY:** NSA CRANE SWMU 29	**PROJECT MANAGER** JOE LUCAS	**PHONE NUMBER** (412) 921-7090	**LABORATORY NAME AND CONTACT:** CAPE FEAR ANALYTICAL / CHRIS CORNWELL
SAMPLERS (SIGNATURE) Ellen Bockstale		**FIELD OPERATIONS LEADER**	**PHONE NUMBER** (502) 569-6698	**ADDRESS** 3306 KITTY HAWK ROAD SUITE 120
		CARRIER/WAYBILL NUMBER 8731 7167 0646 / FEDEX		**CITY, STATE** WILMINGTON, NC 28405

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE (YEAR 2011)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: DIOXIN / FURAN								COMMENTS
									G	ICE									
7/13	1530	29 SS 001 0002	SS001	0	2	SO	G	2	X										HOLD for Analysis
"	1540	29 SB 001 0203	SB001	2	3	SO	G	2	X										
"	1420	29 SS 002 0004	SS002	0	4	SO	G	2	X										
"	1430	29 SB 002 0406	SB002	4	6	SO	G	6	X										MS/MSD
"	1525	29 SB 003 0406	SB003	4	6	SO	G	2	X										
"	1320	29 SS 004 0004	SS004	0	4	SO	G	2	X										
"	1435	29 SS 005 0004	SS005	0	4	SO	G	2	X										
"	1445	29 SB 005 0406	SB005	4	6	SO	G	2	X										
"	1300	29 SS 006 0002	SS006	0	2	SO	G	2	X										
"	1310	29 SB 006 0206	SB006	2	6	SO	G	2	X										
"	—	29 FD 071311-01	—	—	—	SO	G	2	X										
"	—	29 FD 071311-02	—	—	—	SO	G	2	X										

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	7/14/11	16:00	1. RECEIVED BY		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

CAPE FEAR

TETRA TECH NUS, INC. | **CHAIN OF CUSTODY** | **NUMBER** NB 0359 | **PAGE** 2 **OF** _____

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G03137	CRANE - SWMU29	JOE LUCAS	(412) 921 - 7090	CAPE FEAR ANALYTICAL / CHRIS CORNWELL
SAMPLERS (SIGNATURE)		**FIELD OPERATIONS LEADER**	**PHONE NUMBER**	**ADDRESS**
ELLEN BERKLITE		JOHN FLOYD	(502) 568 - 6698	3306 KITTY HAWK ROAD SUITE 120
		CARRIER/WAYBILL NUMBER		**CITY, STATE**
		FEDEX / 8731 - 7167 · 0646		WILMINGTON, NC 28405

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE (YEAR 2011)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: DIOXIN/FURAN	TYPE OF ANALYSIS: TEMPERATURE	TYPE OF ANALYSIS: ICE	TYPE OF ANALYSIS:	TYPE OF ANALYSIS:	TYPE OF ANALYSIS:	TYPE OF ANALYSIS:	TYPE OF ANALYSIS:	COMMENTS
7/13	1550	29SS007 0002	SS007	0	2	SO	G	2	G		X								HOLD FOR ANALYSIS
7/13	1600	29SB007 0204	SB007	2	4	SO	G	2	G		X								
7/13	1500	29SS009 0004	SS009	0	4	SO	G	2	G		X								
7/13	1510	29SB008 0406	SB008	4	6	SO	G	2	G		X								
7/13	1615	29SB011 0203	SB011	2	3	SO	G	2	G		X								
7/13	1905	29SS009 0004	SS009	0	4	SO	G	2	G		X								
7/13	1905	29SB009 0406	SB009	4	6	SO	G	2	G		X								
7/13	16:30	29SS010 0002	SS010	0	2	SO	G	2	G		X								
7/13	16:35	29SB010 0204	SB010	2	4	SO	G	2	G		X								
7/13	16:10	29SS011 0002	SS011	0	2	SO	G	2	G		X								
		TEMPERATURE BLANK	—	—	—	—	—	1				X							

1. RELINQUISHED BY	DATE 7/14/11	TIME 16:00	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

RTI

TETRA TECH NUS, INC. | **CHAIN OF CUSTODY** | **NUMBER** N2 0358 | **PAGE** 2 **OF** _____

PROJECT NO: 112G03137	**FACILITY:** NSA CRANE	**PROJECT MANAGER** JOE LUCAS	**PHONE NUMBER** (412)921-7090	**LABORATORY NAME AND CONTACT:** RTI ANALYTICAL / KATHY JONES
SAMPLERS (SIGNATURE) SNMU29 ELLEN BERKLITE		**FIELD OPERATIONS LEADER** JOHN FLOYD	**PHONE NUMBER** (502)568-6688	**ADDRESS** 31628 GLENDALE STREET
		CARRIER/WAYBILL NUMBER FEDEX 8731 7167 0657		**CITY, STATE** LIVONIA, MI 48150-1827

STANDARD TAT ☐
RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: DRO	SVOC	PAH	PCP	TEMPERATURE				COMMENTS
									G	ICE									
7/13	1550	29SS0070002	SS007	0	2	SO	G	1			X	X	X	X					
	1500	29SS0080004	SS008	0	4	SO	G	1			X	X	X	X					
	1510	29SB0080406	SB008	4	6	SO	G	1			X	X	X	X					
	1405	29SS0090004	SS009	0	4	SO	G	1			X	X	X	X					
	1415	29SB0090406	SB009	4	6	SO	G	1			X	X	X	X					
	1630	29SS0100002	SS010	0	2	SO	G	1			X	X	X	X					
	1635	29SB0100204	SB010	2	4	SO	G	1			X	X	X	X					
	1615	29SB0110203	SB011	2	3	SO	G	1			X	X	X	X					
	1610	29SS0110002	SS011	0	2	SO	G	1			X	X	X	X					
		TEMPERATURE BLANK	—	—	—	—	—	1						X					

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

RTI

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER N3 0356 | PAGE 1 OF _____

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G03137	NSA CRANE	JOE LUCAS	(412)921-7090	KATHY JONES (734) 422-8000
SAMPLERS (SIGNATURE)	SWMU 29	FIELD OPERATIONS LEADER: JOHN FLOYD	PHONE NUMBER: (502) 568-6688	ADDRESS: RTI ANALYTICAL, 31628 GLENDALE STREET
		CARRIER/WAYBILL NUMBER: FEDEX 9731 7167 0657		CITY, STATE: LIVONIA, MICHIGAN 48150-1827

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE (YEAR 2011)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: DRO	SVOC	PAH	PCP					COMMENTS
									G	ICE									
7/13	1530	29 SS001 0002	SS001	0	2	SO	G	1			X	X	X	X					
"	1540	29 SB001 0203	SB001	2	3	SO	G	1			X	X	X	X					MS/MSD
		~~29 SB002 0204~~	~~SB002~~	~~2~~	~~4~~	~~SO~~	~~G~~	~~3~~											~~MS/MSD~~
"	1420	29 SS002 0004	SS002	0	4	SO	G	1			X	X	X	X					
"	1430	29 SB002 0406	SB002	4	6	SO	G	3			X	X	X	X					MS/MSD
"	1525	29 SB003 0406	SB003	4	6	SO	G	1			X	X	X	X					
"	1320	29 SS004 0004	SS004	0	4	SO	G	1			X	X	X	X					
"	1435	29 SS005 0004	SS005	0	4	SO	G	1			X	X	X	X					
"	1445	29 SB005 0406	SB005	4	6	SO	G	1			X	X	X	X					
"	1300	29 SS006 0002	SS006	0	2	SO	G	1			X	X	X	X					
"	1310	29 SB006 0206	SB006	2	6	SO	G	1			X	X	X	X					
"	—	29 FD071311-01	—	—	—	SO	G	1			X	X	X	X					
"	—	29 FD071311-02	—	—	—	SO	G	1			X	X	X	X					

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
	9/14/11	1800			
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

APPENDIX C

SWMU 29 ANALYTICAL DATA

APPENDIX C.1

SWMU 29

ANALYTICAL DATA

SURFACE SOIL

SWMU 29
SURFACE SOIL RESULTS

LOCATION	HHRA	ERA	MIN	29SB001		29SB002		29SB004		29SB005		29SB006		29SB007	
SAMPLE ID				29SS0010002		29SS0020004		29SS0040004		29SS0050004		29SS0060002		29SS0070002	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX				SO		SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SS		SS		SS		SS		SS		SS	
TOP DEPTH				0		0		0		0		0		0	
BOTTOM DEPTH				2		4		4		4		2		2	
MISCELLANEOUS PARAMETERS (%)															
PERCENT MOISTURE	NC	NC	NC	7.6		4.8		12		5.2		11		10	
PETROLEUM HYDROCARBONS (UG/KG)															
DRO (C08-C28)	230000	NC	230000	4000	U	12000	J	5700	J	14000	J	14000	J	4900	J
SEMIVOLATILES (UG/KG)															
1,2,4,5-TETRACHLOROBENZENE	1020	2020	1020	18	U	17	U	19	U	18	U	19	UJ	18	UJ
1,2,4-TRICHLOROBENZENE	136	11100	136	18	U	17	UJ	19	UJ	18	UJ	19	UJ	18	UJ
1,2-DICHLOROBENZENE	7200	2960	2960	18	U	17	U	19	U	18	U	19	UJ	18	UJ
1,3-DICHLOROBENZENE	2300	37700	2300	18	U	17	U	19	U	18	U	19	UJ	18	UJ
1,4-DICHLOROBENZENE	8.2	546	8.2	18	U	17	UJ	19	UJ	18	UJ	19	UJ	18	UJ
2,3,4,6-TETRACHLOROPHENOL	134000	199	199	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2,4,5-TRICHLOROPHENOL	250000	14100	14100	18	UJ	17	UJ	19	UJ	18	UJ	19	UJ	18	UJ
2,4,6-TRICHLOROPHENOL	70	9940	70	18	U	17	UJ	19	UJ	18	UJ	19	UJ	18	UJ
2,4-DICHLOROPHENOL	1100	87500	1100	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2,4-DIMETHYLPHENOL	9000	10	10	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2,4-DINITROPHENOL	290	60.9	60.9	360	UJ	350	UJ	380	UJ	350	UJ	370	UJ	370	UJ
2,4-DINITROTOLUENE	5.8	1280	5.8	18	UJ	17	UJ	19	UJ	18	UJ	19	UJ	18	UJ
2,6-DICHLOROPHENOL	1100	1170	1100	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2,6-DINITROTOLUENE	1000	32.8	32.8	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2-CHLORONAPHTHALENE	42000	12.2	12.2	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2-CHLOROPHENOL	750	243	243	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2-METHYLNAPHTHALENE	3100	29000	3100	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2-METHYLPHENOL	14000	40400	14000	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2-NITROANILINE	670	74100	670	18	U	17	U	19	U	18	U	19	UJ	18	UJ
2-NITROPHENOL	1640	1600	1600	18	U	17	U	19	U	18	U	19	UJ	18	UJ
3-METHYLPHENOL	9800	3490	3490	18	U	17	U	19	U	18	U	19	UJ	18	UJ
3-NITROANILINE	NC	3160	3160	18	U	17	U	19	U	18	U	19	UJ	18	UJ
4,6-DINITRO-2-METHYLPHENOL	106	144	106	90	UJ	87	UJ	94	UJ	88	UJ	93	UJ	92	UJ
4-CHLORO-3-METHYLPHENOL	86000	7950	7950	18	U	17	U	19	U	18	U	19	UJ	18	UJ
4-CHLOROANILINE	2.8	1100	2.8	18	U	17	U	19	U	18	U	19	UJ	18	UJ
4-NITROANILINE	28	21900	28	18	U	17	U	19	U	18	U	19	UJ	18	UJ
4-NITROPHENOL	NC	5120	5120	360	U	350	U	380	U	350	U	370	UJ	370	UJ
ACENAPHTHENE	130000	29000	29000	18	U	36		19	U	25	J	19	UJ	11	J
ACENAPHTHYLENE	18000	29000	18000	18	U	17	U	19	U	18	U	19	UJ	18	UJ
ANTHRACENE	1700000	29000	29000	9.7	J	75		19	U	50		19	UJ	22	J
BENZO(A)ANTHRACENE	150	1100	150	67		**280**		35	J	120		51	J	56	J
BENZO(A)PYRENE	15	1100	15	**79**		**320**		**41**		**110**		**69**	**J**	**54**	**J**
BENZO(B)FLUORANTHENE	150	1100	150	140		**500**		82		**180**		**160**	**J**	87	J
BENZO(G,H,I)PERYLENE	170000	1100	1100	64		180		36	J	99		98	J	36	J
BENZO(K)FLUORANTHENE	1500	1100	1100	73		150		28	J	77		66	J	38	J
CARBAZOLE	5900	NC	5900	12	J	62	J	19	U	26	J	19	UJ	15	J
CHRYSENE	15000	1100	1100	84		320		46		130		79	J	67	J
DIBENZO(A,H)ANTHRACENE	15	1100	15	36	U	**52**	**J**	7.6	UJ	7	UJ	7.5	UJ	7.4	UJ

SWMU 29
SURFACE SOIL RESULTS
PAGE 2 OF 4

LOCATION	HHRA	ERA	MIN	29SB001		29SB002		29SB004		29SB005		29SB006		29SB007	
SAMPLE ID				29SS0010002		29SS0020004		29SS0040004		29SS0050004		29SS0060002		29SS0070002	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX				SO		SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SS		SS		SS		SS		SS		SS	
TOP DEPTH				0		0		0		0		0		0	
BOTTOM DEPTH				2		4		4		4		2		2	
DIBENZOFURAN	4900	NC	4900	18	U	13	J	19	U	10	J	19	UJ	18	UJ
FLUORANTHENE	230000	29000	29000	110		540		56		190		59	J	120	J
FLUORENE	170000	29000	29000	18	U	22	J	19	U	21	J	19	UJ	8.1	J
HEXACHLOROBENZENE	10.6	199	10.6	18	U	17	UJ	19	UJ	18	UJ	19	UJ	18	UJ
INDENO(1,2,3-CD)PYRENE	150	1100	150	52		150		34	J	72		71	J	31	J
NAPHTHALENE	9.4	29000	9.4	18	U	7.3	UJ	7.6	UJ	7	UJ	7.5	UJ	7.4	UJ
NITROBENZENE	1.58	1310	1.58	18	U	17	U	19	U	18	U	19	UJ	18	UJ
N-NITROSODIPHENYLAMINE	1500	545	545	18	U	17	U	19	U	18	U	19	UJ	18	UJ
PENTACHLOROBENZENE	4400	497	497	18	U	17	U	19	U	18	U	19	UJ	18	UJ
PENTACHLOROPHENOL	28	2100	28	90	U	87	UJ	94	UJ	88	UJ	93	UJ	92	UJ
PHENANTHRENE	13000	29000	13000	59		390		24	J	230		37	J	100	J
PHENOL	56000	120000	56000	18	U	17	U	19	U	18	U	19	UJ	18	UJ
PYRENE	340000	1100	1100	230		1100		110		460		170	J	200	J

LOCATION	HHRA	ERA	MIN	29SB008		29SB009		29SB010		29SB010		29SB011	
SAMPLE ID				29SS0080004		29SS0090004		29SS0100002		29SS0100002-D		29SS0110002	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		DUP		NORMAL	
MATRIX				SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SS		SS		SS		SS		SS	
TOP DEPTH				0		0		0		0		0	
BOTTOM DEPTH				4		4		2		2		2	
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC	NC	NC	5.4		6		4.2		16		5.1	
PETROLEUM HYDROCARBONS (UG/KG)													
DRO (C08-C28)	230000	NC	230000	3400	U	45000	J	3600	U	2600	U	3700	J
SEMIVOLATILES (UG/KG)													
1,2,4,5-TETRACHLOROBENZENE	1020	2020	1020	18	UJ	18	UJ	17	UJ	20	U	17	U
1,2,4-TRICHLOROBENZENE	136	11100	136	18	UJ	18	UJ	35	UJ	20	UJ	17	UJ
1,2-DICHLOROBENZENE	7200	2960	2960	18	UJ	18	UJ	17	UJ	20	U	17	U
1,3-DICHLOROBENZENE	2300	37700	2300	18	UJ	18	UJ	17	UJ	20	U	17	U
1,4-DICHLOROBENZENE	8.2	546	8.2	18	UJ	18	UJ	35	UJ	20	UJ	17	UJ
2,3,4,6-TETRACHLOROPHENOL	134000	199	199	18	UJ	18	UJ	17	UJ	20	UJ	17	U
2,4,5-TRICHLOROPHENOL	250000	14100	14100	18	UJ	18	UJ	17	UJ	20	UJ	17	UJ
2,4,6-TRICHLOROPHENOL	70	9940	70	18	UJ	18	UJ	35	UJ	20	UJ	17	UJ
2,4-DICHLOROPHENOL	1100	87500	1100	18	UJ	18	UJ	17	UJ	20	UJ	17	U
2,4-DIMETHYLPHENOL	9000	10	10	18	UJ	18	UJ	17	UJ	20	UJ	17	U
2,4-DINITROPHENOL	290	60.9	60.9	350	UJ	350	UJ	350	UJ	400	UJ	350	UJ
2,4-DINITROTOLUENE	5.8	1280	5.8	18	UJ	18	UJ	17	UJ	20	U	17	UJ
2,6-DICHLOROPHENOL	1100	1170	1100	18	UJ	18	UJ	17	UJ	20	UJ	17	U
2,6-DINITROTOLUENE	1000	32.8	32.8	18	UJ	18	UJ	17	UJ	20	U	17	U
2-CHLORONAPHTHALENE	42000	12.2	12.2	18	UJ	18	UJ	17	UJ	20	U	17	U
2-CHLOROPHENOL	750	243	243	18	UJ	18	UJ	17	UJ	20	UJ	17	U
2-METHYLNAPHTHALENE	3100	29000	3100	18	UJ	18	UJ	17	UJ	20	U	17	U
2-METHYLPHENOL	14000	40400	14000	18	UJ	18	UJ	17	UJ	20	UJ	17	U
2-NITROANILINE	670	74100	670	18	UJ	18	UJ	17	UJ	20	U	17	U
2-NITROPHENOL	1640	1600	1600	18	UJ	18	UJ	17	UJ	20	UJ	17	U
3-METHYLPHENOL	9800	3490	3490	18	UJ	18	UJ	17	UJ	20	UJ	17	UJ
3-NITROANILINE	NC	3160	3160	18	UJ	18	UJ	17	UJ	20	U	17	U
4,6-DINITRO-2-METHYLPHENOL	106	144	106	88	UJ	88	UJ	87	UJ	99	UJ	87	UJ
4-CHLORO-3-METHYLPHENOL	86000	7950	7950	18	UJ	18	UJ	17	UJ	20	UJ	17	U
4-CHLOROANILINE	2.8	1100	2.8	18	UJ	18	UJ	17	UJ	20	U	17	U
4-NITROANILINE	28	21900	28	18	UJ	18	UJ	17	UJ	20	U	17	U
4-NITROPHENOL	NC	5120	5120	350	UJ	350	UJ	350	UJ	400	UJ	350	U
ACENAPHTHENE	130000	29000	29000	35	J	18	UJ	17	UJ	20	U	7.3	J
ACENAPHTHYLENE	18000	29000	18000	18	UJ	18	UJ	17	UJ	20	U	17	U
ANTHRACENE	1700000	29000	29000	57	J	18	UJ	17	UJ	20	U	19	J
BENZO(A)ANTHRACENE	150	1100	150	140	J	31	J	11	J	20	U	63	J
BENZO(A)PYRENE	15	1100	15	**110**	**J**	**38**	**J**	7.3	J	8	UJ	**65**	**J**
BENZO(B)FLUORANTHENE	150	1100	150	**180**	**J**	70	J	15	J	20	U	130	J
BENZO(G,H,I)PERYLENE	170000	1100	1100	68	J	69	J	17	UJ	20	U	41	J
BENZO(K)FLUORANTHENE	1500	1100	1100	85	J	33	J	17	UJ	20	U	43	J
CARBAZOLE	5900	NC	5900	46	J	18	UJ	17	UJ	20	U	14	J
CHRYSENE	15000	1100	1100	130	J	54	J	8	J	20	U	81	J
DIBENZO(A,H)ANTHRACENE	15	1100	15	**24**	**J**	7.1	UJ	14	UJ	8	UJ	**24**	**J**

SWMU 29
SURFACE SOIL RESULTS
PAGE 4 OF 4

LOCATION	HHRA	ERA	MIN	29SB008		29SB009		29SB010		29SB010		29SB011	
SAMPLE ID				29SS0080004		29SS0090004		29SS0100002		29SS0100002-D		29SS0110002	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		DUP		NORMAL	
MATRIX				SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SS		SS		SS		SS		SS	
TOP DEPTH				0		0		0		0		0	
BOTTOM DEPTH				4		4		2		2		2	
DIBENZOFURAN	4900	NC	4900	15	J	18	UJ	17	UJ	20	U	17	U
FLUORANTHENE	230000	29000	29000	270	J	30	J	20	J	20	U	130	
FLUORENE	170000	29000	29000	28	J	18	UJ	17	UJ	20	U	17	U
HEXACHLOROBENZENE	10.6	199	10.6	18	UJ	18	UJ	35	UJ	20	UJ	17	UJ
INDENO(1,2,3-CD)PYRENE	150	1100	150	52	J	40	J	35	UJ	40	U	36	J
NAPHTHALENE	9.4	29000	9.4	7.1	UJ	7.1	UJ	14	UJ	8	UJ	7	UJ
NITROBENZENE	1.58	1310	1.58	18	UJ	18	UJ	17	UJ	20	U	17	U
N-NITROSODIPHENYLAMINE	1500	545	545	18	UJ	18	UJ	17	UJ	20	U	17	U
PENTACHLOROBENZENE	4400	497	497	18	UJ	18	UJ	17	UJ	20	U	17	U
PENTACHLOROPHENOL	28	2100	28	88	UJ	88	UJ	170	UJ	99	UJ	87	UJ
PHENANTHRENE	13000	29000	13000	280	J	26	J	7.3	J	20	U	90	
PHENOL	56000	120000	56000	18	UJ	18	UJ	17	UJ	20	UJ	17	U
PYRENE	340000	1100	1100	460	J	100	J	10	J	20	U	230	J

APPENDIX C.2

SWMU 29

ANALYTICAL DATA

SUBSURFACE SOIL

SWMU 29
SUBSURFACE SOIL RESULTS

LOCATION	HHRA	ERA	MIN	29SB001		29SB002		29SB003		29SB005		29SB006	
SAMPLE ID				29SB0010203		29SB0020406		29SB0030406		29SB0050406		29SB0060206	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX				SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SB		SB		SB		SB		SB	
TOP DEPTH				2		4		4		4		2	
BOTTOM DEPTH				3		6		6		6		6	
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC	NC	NC	13		16		12		13		19	
PETROLEUM HYDROCARBONS (UG/KG)													
DRO (C08-C28)	230000	NC	230000	2200	U	1500	U	4900		**310000**	**J**	3900	U
SEMIVOLATILES (UG/KG)													
1,2,4,5-TETRACHLOROBENZENE	1020	2020	1020	19	U	20	U	19	UJ	19	U	21	U
1,2,4-TRICHLOROBENZENE	136	11100	136	19	UJ	20	UJ	19	UJ	19	UJ	21	UJ
1,2-DICHLOROBENZENE	7200	2960	2960	19	U	20	U	19	UJ	19	U	21	U
1,3-DICHLOROBENZENE	2300	37700	2300	19	U	20	U	19	UJ	19	U	21	U
1,4-DICHLOROBENZENE	8.2	546	8.2	19	UJ	20	UJ	19	UJ	19	UJ	21	UJ
2,3,4,6-TETRACHLOROPHENOL	134000	199	199	19	UJ	20	U	19	UJ	19	UJ	21	U
2,4,5-TRICHLOROPHENOL	250000	14100	14100	19	UJ	20	U	19	UJ	19	UJ	21	U
2,4,6-TRICHLOROPHENOL	70	9940	70	19	UJ	20	UJ	19	UJ	19	UJ	21	UJ
2,4-DICHLOROPHENOL	1100	87500	1100	19	UJ	20	U	19	UJ	19	UJ	21	U
2,4-DIMETHYLPHENOL	9000	10	10	19	UJ	20	U	19	UJ	19	UJ	21	U
2,4-DINITROPHENOL	290	60.9	60.9	380	UJ	390	UJ	380	UJ	380	UJ	410	UJ
2,4-DINITROTOLUENE	5.8	1280	5.8	19	U	20	U	19	UJ	19	U	21	U
2,6-DICHLOROPHENOL	1100	1170	1100	19	UJ	20	U	19	UJ	19	UJ	21	U
2,6-DINITROTOLUENE	1000	32.8	32.8	19	U	20	U	19	UJ	19	U	21	U
2-CHLORONAPHTHALENE	42000	12.2	12.2	19	U	20	U	19	UJ	19	U	21	U
2-CHLOROPHENOL	750	243	243	19	UJ	20	U	19	UJ	19	UJ	21	U
2-METHYLNAPHTHALENE	3100	29000	3100	19	U	20	U	19	UJ	8.7	J	21	U
2-METHYLPHENOL	14000	40400	14000	19	UJ	20	U	19	UJ	19	UJ	21	U
2-NITROANILINE	670	74100	670	19	U	20	U	19	UJ	19	U	21	U
2-NITROPHENOL	1640	1600	1600	19	UJ	20	U	19	UJ	19	UJ	21	U
3-METHYLPHENOL	9800	3490	3490	19	UJ	20	U	19	UJ	19	UJ	21	U
3-NITROANILINE	NC	3160	3160	19	U	20	U	19	UJ	19	U	21	U
4,6-DINITRO-2-METHYLPHENOL	106	144	106	96	UJ	98	UJ	94	UJ	95	UJ	100	UJ
4-CHLORO-3-METHYLPHENOL	86000	7950	7950	19	UJ	20	U	19	UJ	19	UJ	21	U
4-CHLOROANILINE	2.8	1100	2.8	19	U	20	U	19	UJ	19	U	21	U
4-NITROANILINE	28	21900	28	19	U	20	U	19	UJ	19	U	21	U
4-NITROPHENOL	NC	5120	5120	380	UJ	390	U	380	UJ	380	UJ	410	U
ACENAPHTHENE	130000	29000	29000	19	U	20	U	19	UJ	160		21	U
ACENAPHTHYLENE	18000	29000	18000	19	U	20	U	19	UJ	19	U	21	U
ANTHRACENE	1700000	29000	29000	7.7	J	20	U	19	UJ	260		21	U
BENZO(A)ANTHRACENE	150	1100	150	44		20	U	26	J	**460**		21	U
BENZO(A)PYRENE	15	1100	15	**42**		7.9	UJ	**22**	**J**	**410**		8.3	UJ
BENZO(B)FLUORANTHENE	150	1100	150	52		20	U	28	J	**540**		21	U
BENZO(G,H,I)PERYLENE	170000	1100	1100	32	J	20	U	19	UJ	150		21	U
BENZO(K)FLUORANTHENE	1500	1100	1100	24	J	20	U	19	UJ	260		21	U
CARBAZOLE	5900	NC	5900	19	U	20	U	19	UJ	170	J	21	U
CHRYSENE	15000	1100	1100	47		20	U	15	J	480		21	U
DIBENZO(A,H)ANTHRACENE	15	1100	15	13	J	7.9	UJ	7.6	UJ	**86**		8.3	UJ

SWMU 29
SUBSURFACE SOIL RESULTS
PAGE 2 OF 4

LOCATION	HHRA	ERA	MIN	29SB001		29SB002		29SB003		29SB005		29SB006	
SAMPLE ID				29SB0010203		29SB0020406		29SB0030406		29SB0050406		29SB0060206	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX				SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SB		SB		SB		SB		SB	
TOP DEPTH				2		4		4		4		2	
BOTTOM DEPTH				3		6		6		6		6	
DIBENZOFURAN	4900	NC	4900	19	U	20	U	19	UJ	84	J	21	U
FLUORANTHENE	230000	29000	29000	100		20	U	49	J	1400		21	U
FLUORENE	170000	29000	29000	19	U	20	U	19	UJ	170		21	U
HEXACHLOROBENZENE	10.6	199	10.6	19	UJ	20	UJ	19	UJ	19	UJ	21	UJ
INDENO(1,2,3-CD)PYRENE	150	1100	150	21	J	39	U	38	UJ	150		41	U
NAPHTHALENE	9.4	29000	9.4	7.7	UJ	20	UJ	7.6	UJ	**11**	**J**	8.3	UJ
NITROBENZENE	1.58	1310	1.58	19	U	20	U	19	UJ	19	U	21	U
N-NITROSODIPHENYLAMINE	1500	545	545	19	U	20	U	19	UJ	19	U	21	U
PENTACHLOROBENZENE	4400	497	497	19	U	20	U	19	UJ	19	U	21	U
PENTACHLOROPHENOL	28	2100	28	96	UJ	98	UJ	94	UJ	95	UJ	100	UJ
PHENANTHRENE	13000	29000	13000	44		20	U	21	J	1000		21	U
PHENOL	56000	120000	56000	19	UJ	20	U	19	UJ	19	UJ	21	U
PYRENE	340000	1100	1100	63		20	U	32	J	820		21	U

SWMU 29
SUBSURFACE SOIL RESULTS
PAGE 3 OF 4

LOCATION	HHRA	ERA	MIN	29SB0060206-D		29SB007		29SB008		29SB009		29SB010		29SB011	
SAMPLE ID				29SB0060206-D		29SB0070204		29SB0080406		29SB0090406		29SB0100204		29SB0110203	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				DUP		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX				SO		SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SB		SB		SB		SB		SB		SB	
TOP DEPTH				2		2		4		4		2		2	
BOTTOM DEPTH				6		4		6		6		4		3	
MISCELLANEOUS PARAMETERS (%)															
PERCENT MOISTURE	NC	NC	NC	18		12		5.9		17		18		17	
PETROLEUM HYDROCARBONS (UG/KG)															
DRO (C08-C28)	230000	NC	230000	3300	U	5100		7200		4700		4800		3400	U
SEMIVOLATILES (UG/KG)															
1,2,4,5-TETRACHLOROBENZENE	1020	2020	1020	20	U	19	U	18	UJ	20	UJ	20	U	20	U
1,2,4-TRICHLOROBENZENE	136	11100	136	20	UJ	19	UJ	18	UJ	40	UJ	20	UJ	40	UJ
1,2-DICHLOROBENZENE	7200	2960	2960	20	U	19	U	18	UJ	20	UJ	20	U	20	U
1,3-DICHLOROBENZENE	2300	37700	2300	20	U	19	U	18	UJ	20	UJ	20	U	20	U
1,4-DICHLOROBENZENE	8.2	546	8.2	20	UJ	19	UJ	18	UJ	40	UJ	20	UJ	40	UJ
2,3,4,6-TETRACHLOROPHENOL	134000	199	199	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
2,4,5-TRICHLOROPHENOL	250000	14100	14100	20	U	19	U	18	UJ	20	UJ	20	U	20	U
2,4,6-TRICHLOROPHENOL	70	9940	70	20	UJ	19	UJ	18	UJ	40	UJ	20	UJ	40	UJ
2,4-DICHLOROPHENOL	1100	87500	1100	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
2,4-DIMETHYLPHENOL	9000	10	10	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
2,4-DINITROPHENOL	290	60.9	60.9	410	UJ	380	UJ	350	UJ	400	UJ	400	UJ	400	UJ
2,4-DINITROTOLUENE	5.8	1280	5.8	20	U	19	U	18	UJ	20	UJ	20	U	20	U
2,6-DICHLOROPHENOL	1100	1170	1100	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
2,6-DINITROTOLUENE	1000	32.8	32.8	20	U	19	U	18	UJ	20	UJ	20	U	20	U
2-CHLORONAPHTHALENE	42000	12.2	12.2	20	U	19	U	18	UJ	20	UJ	20	U	20	U
2-CHLOROPHENOL	750	243	243	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
2-METHYLNAPHTHALENE	3100	29000	3100	20	U	19	U	18	UJ	20	UJ	20	U	20	U
2-METHYLPHENOL	14000	40400	14000	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
2-NITROANILINE	670	74100	670	20	U	19	U	18	UJ	20	UJ	20	U	20	U
2-NITROPHENOL	1640	1600	1600	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
3-METHYLPHENOL	9800	3490	3490	20	U	19	UJ	18	UJ	20	UJ	20	U	20	UJ
3-NITROANILINE	NC	3160	3160	20	U	19	U	18	UJ	20	UJ	20	U	20	U
4,6-DINITRO-2-METHYLPHENOL	106	144	106	100	UJ	94	UJ	88	UJ	100	UJ	100	UJ	100	UJ
4-CHLORO-3-METHYLPHENOL	86000	7950	7950	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
4-CHLOROANILINE	2.8	1100	2.8	20	U	19	U	18	UJ	20	UJ	20	U	20	U
4-NITROANILINE	28	21900	28	20	U	19	U	18	UJ	20	UJ	20	U	20	U
4-NITROPHENOL	NC	5120	5120	410	U	380	U	350	UJ	400	UJ	400	U	400	UJ
ACENAPHTHENE	130000	29000	29000	20	U	19	U	18	UJ	20	UJ	20	U	130	
ACENAPHTHYLENE	18000	29000	18000	20	U	19	U	18	UJ	20	UJ	20	U	20	U
ANTHRACENE	1700000	29000	29000	20	U	19	U	18	UJ	20	UJ	20	U	260	
BENZO(A)ANTHRACENE	150	1100	150	20	U	19	U	18	UJ	20	UJ	20	U	**640**	
BENZO(A)PYRENE	15	1100	15	8.1	UJ	8	UJ	7.1	UJ	16	UJ	8.1	UJ	**540**	
BENZO(B)FLUORANTHENE	150	1100	150	20	U	19	U	18	UJ	20	UJ	20	U	**690**	
BENZO(G,H,I)PERYLENE	170000	1100	1100	20	U	19	U	18	UJ	20	UJ	20	U	260	
BENZO(K)FLUORANTHENE	1500	1100	1100	20	U	19	U	18	UJ	20	UJ	20	U	280	
CARBAZOLE	5900	NC	5900	20	U	19	U	18	UJ	20	UJ	20	U	170	J
CHRYSENE	15000	1100	1100	20	U	19	U	18	UJ	20	UJ	20	U	610	
DIBENZO(A,H)ANTHRACENE	15	1100	15	8.1	UJ	8	UJ	7.1	UJ	16	UJ	8.1	UJ	**81**	

SWMU 29
SUBSURFACE SOIL RESULTS
PAGE 4 OF 4

LOCATION	HHRA	ERA	MIN	29SB0060206-D		29SB007		29SB008		29SB009		29SB010		29SB011	
SAMPLE ID				29SB0060206-D		29SB0070204		29SB0080406		29SB0090406		29SB0100204		29SB0110203	
SAMPLE DATE				20110713		20110713		20110713		20110713		20110713		20110713	
SAMPLE CODE				DUP		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
MATRIX				SO		SO		SO		SO		SO		SO	
SAMPLE TYPE				NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
SUBMATRIX				SB		SB		SB		SB		SB		SB	
TOP DEPTH				2		2		4		4		2		2	
BOTTOM DEPTH				6		4		6		6		4		3	
DIBENZOFURAN	4900	NC	4900	20	U	19	U	18	UJ	20	UJ	20	U	38	J
FLUORANTHENE	230000	29000	29000	20	U	19	U	18	UJ	20	UJ	20	U	1700	
FLUORENE	170000	29000	29000	20	U	19	U	18	UJ	20	UJ	20	U	120	
HEXACHLOROBENZENE	10.6	199	10.6	20	UJ	19	UJ	18	UJ	40	UJ	20	UJ	40	UJ
INDENO(1,2,3-CD)PYRENE	150	1100	150	41	U	38	U	35	UJ	40	UJ	40	U	**240**	
NAPHTHALENE	9.4	29000	9.4	8.1	UJ	8	UJ	7.1	UJ	16	UJ	8.1	UJ	16	UJ
NITROBENZENE	1.58	1310	1.58	20	U	19	U	18	UJ	20	UJ	20	U	20	U
N-NITROSODIPHENYLAMINE	1500	545	545	20	U	19	U	18	UJ	20	UJ	20	U	20	U
PENTACHLOROBENZENE	4400	497	497	20	U	19	U	18	UJ	20	UJ	20	U	20	U
PENTACHLOROPHENOL	28	2100	28	100	UJ	94	UJ	88	UJ	200	UJ	100	UJ	200	UJ
PHENANTHRENE	13000	29000	13000	20	U	19	U	18	UJ	20	UJ	20	U	1000	
PHENOL	56000	120000	56000	20	U	19	U	18	UJ	20	UJ	20	U	20	UJ
PYRENE	340000	1100	1100	20	U	19	U	18	UJ	20	UJ	20	U	1000	

APPENDIX D

DATA QUALITY REVIEW

Data Validation Process and Data Quality Review

This section contains a description of the data review processes used to determine whether analytical laboratory data were of acceptable technical quality for use in decision making. The review began with data validation, which is a comparison of data quality indicators (DQIs) against prescribed acceptance criteria. The DQIs used are measures to assess the bias and precision of the analytical calibrations and sample analyses. The output of this review was a set of alphabetic flags such as ”U,” “J,” “R,” or combinations thereof, that may have been assigned to individual results based on the validation effort. These flags were used to infer the general quality of the data and if data quality meets the data quality objectives (DQOs) of the project. The DQOs are presented in the Sampling and Analysis Plan for SWMU 29 – PCP Dip Tank, Building 56 Area (July 2011). Also evaluated were the measures of data completeness, sensitivity, comparability and representativeness.

Data Validation Process

In accordance with Navy requirements for this project, Tetra Tech performed a full data validation on 100 percent of analytical laboratory results. Sample data validation generally followed the guidelines presented in EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (1999).

Data validation specifications require assignment of data qualifiers in response to various data deficiencies. Validation specifications also require data qualifiers be applied to results that are reported as being less than the detection limit. The flags used for data qualification are as follows:

U –The analytical method could not detect the analyte at the sample specific detection limit. This qualifier is also added to a result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

UJ – The analytical method could not detect the analyte at the sample specific detection limit; however, the sample-specific detection limit may be inaccurate or imprecise based on validation review criteria. The associated numerical detection limit may be inaccurate or imprecise.

J –The chemical was present; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is an estimate of the true concentration.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory may be unreliable and unusable. The application of this qualifier is for cases of gross

technical deficiencies (i.e., holding times missed by a factor of two or more times the specified time limit, severe calibration non-compliances, and extremely low quality control recoveries).

R – The result is unusable. The positive analytical result reported by the laboratory is unreliable and unusable. The application of this qualifier is for cases of gross technical deficiencies.

The preceding data qualifiers categorize data as indicative of major or minor problems. Major problems result in the rejection of data and qualification with UR or R data validation qualifiers. Minor problems result in the estimation of data, and qualification with U, J, and UJ data validation qualifiers. It is noteworthy that a U qualifier does not necessarily indicate that a data deficiency exists because all non-detect values are flagged with the U qualifier regardless of whether a quality deficiency has been detected.

When data are qualified or rejected a data qualifier code is associated with the data by Tetra Tech. The qualifier codes used for validation are as follows:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-line drifting)
P = Uncertainty near detection limit (<2 x IDL for inorganics and <CRDL for organics)
Q = Other problems (can encompass a number of issues; i.e., chromatography, interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin

U = % Difference between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient r < 0.995
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed

Data Validation Outputs

After data were validated, a list was developed of non-conformities requiring data qualifier flags that were used to alert the data user to inaccurate or imprecise data. For situations in which several QC criteria were out of specification, the data validator made professional judgments and or comments on the validity of the overall data package. The reviewer then prepared a technical memorandum presenting qualification of the data, if necessary, and the rationale for making such qualifications. The net result was a data package that had been carefully reviewed for its adherence to prescribed technical requirements. Pertinent quality estimates are summarized in a more quantitative format in the following section.

Data Quality Review

Some of the DQIs are generated from analysis of field samples (e.g., field duplicates) and some are generated from the analysis of laboratory samples (e.g., laboratory duplicates). Individually, field and laboratory DQIs provide measures of the performance of the respective investigative operations (field or laboratory). If individual QC results were acceptable, there was no assignment of validation flags to an analytical result; otherwise, there was assignment of a flag indicating the type of QC deficiency to the result as presented in Table 1 for soil samples. No data collected for SWMU 29 – PCP Dip Tank, Building 56 Area were rejected. All data for SWMU 29 – PCP Dip Tank, Building 56 Area are considered valid for their intended purpose.

Completeness

Completeness is a measure of the number of valid samples or measurements that are available relative to the number of samples or measurements that were intended to be generated. For this project, completeness was measured on two different bases: samples collected and laboratory measurements.

- Sample completeness was a measure of the usable samples collected as compared to those intended to be collected.

- Laboratory measurement completeness was a measure of the amount of usable, valid laboratory measurements per matrix obtained for each target analyte.

Usable, valid samples (or results) were those judged, after data assessment, to represent the sampling populations and to have not been disqualified for use through data validation or additional data review. Completeness was determined using the following equation:

$$\%C = \frac{V}{T} \times 100$$

where %C = percent completeness
V = number of samples (or results) determined to be valid
T = total number of planned samples (or results)

Sample collection deviations for the SWMU 29 – PCP Dip Tank, Building 56 Area are listed in Table 2-3. The only reason for not collecting a proposed sample was because of boring refusal at the depth of sample collection. The sample completeness will be considered 100 percent because all samples that could be collected were collected. The laboratory analytical completeness was 100%.

Sensitivity

Analytical sensitivity was generally satisfactory to meet DQOs presented in the Sampling and Analysis Plan for SWMU 29 – PCP Dip Tank, Building 56 Area (July 2011). It was known at the start of the project, however, that the laboratory could not meet the screening level limits for several analytes. The laboratory reported the nondetected results down the limit of detection (LOD) in order to meet the screening level limits for as many analytes as possible. Table 2 presents the range of nondetected values for analytes that did not meet the screening level limits for soils. The majority of LOD exceedances are within a factor of 2 to 4 of the targeted risk-based criterion except for nitrobenzene and 4-chloroaniline, which are not anticipated to be site-related contaminants anyway. The range and number of exceedances are not considered excessive and should not have an impact on the quality of the data.

The following are reasons other than the laboratory LOD that can cause a nondetected result to exceed the screening level limits.

1. Laboratory or field blank contamination can cause the LOD to be raised to exceed screening level limits.
2. Percent moisture in soil samples can cause the adjusted LOD to exceed screening level limits.

3. Sample dilution due to concentrations greater than the calibration range of the instrument or due to matrix interference can raise the LOD to above the screening level limits.

The risk assessment will determine the significance, if any that the nondetected excedances of the screening level limits have upon the data set.

Laboratory Accuracy

Accuracy in the laboratory is measured through the comparison of a laboratory control sample (LCS) result to a known or calculated value and is expressed as a percent recovery (%R). Surrogates and internal standards assess accuracy in organic methods. LCSs assess the accuracy of laboratory operations with minimal sample matrix effects. Surrogate compound analyses measure the combined accuracy effects of the sample matrix, sample preparation, and sample measurement. Internal standards, added after preparation, are for sample quantitation. Laboratory accuracy is determined by comparing calculated percent recoveries to accuracy control limits specified by the laboratory using the appropriate analytical method.

Percent recovery is calculated using the following equation:

$$\%R = \frac{Ss - So}{S} \times 100$$

where %R = percent recovery
Ss = result of spiked sample
So = result of non-spiked sample
S = concentration of spiked amount.

Table 1 shows that the soil results were qualified because of hold time, blank contamination, LCS, surrogate, internal standard, or calibration noncompliances. The noncompliances in general do not show any directional bias trends within the data sets. Overall, the laboratory accuracy was acceptable and the amount of data qualified is not considered excessive. There were no quality control deficiencies noted for field accuracy.

Laboratory Precision

Precision is a measure of the degree to which two or more measurements are in agreement and describes the reproducibility of measurements of the same parameter for samples analyzed under similar conditions.

Precision for chemical parameters is expressed as a Relative Percent Difference (RPD), which is defined as the ratio of the difference to the mean for the two values being evaluated. RPDs, typically expressed as percentages, are used to evaluate both field and laboratory duplicate precision and are calculated as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where RPD = relative percent difference
V1, V2 = two results obtained by analyzing duplicate samples

The precision estimates obtained from duplicate field samples encompass the combined uncertainty associated with sample collection, homogenization, splitting, handling, laboratory and field storage (as applicable), preparation for analysis, and analysis. In contrast, precision estimates obtained from analyzing duplicate laboratory samples incorporate only homogenization, subsampling, preparation for analysis, laboratory storage (if applicable), and analysis uncertainties.

Laboratory or field duplicate imprecision did not result in any qualification of the soil data.

Comparability

Comparability is defined as the confidence with which one data set can be compared with another (e.g., among sampling points and among sampling events). Comparability was achieved by using standardized sampling and analysis methods, as well as standardized data reporting formats. Comparability of laboratory measurements was achieved primarily through the use and documentation of standard sampling and analytical methods. Results were reported in units that ensured comparability with previous data. Comparability of laboratory measurements was assessed primarily through the use of QC samples and through adherence to the Sampling and Analysis Plan for SWMU 29 – PCP Dip Tank, Building 56 Area (July 2011).

Representativeness

Representativeness is an expression of the degree to which data accurately and precisely depict the actual characteristics of a population or environmental condition existing at the site.

The Sampling and Analysis Plan for SWMU 29 – PCP Dip Tank, Building 56 Area (July 2011) and the use of standardized sampling, sample handling, sample analysis, and data reporting procedures were

designed so that the final data would be accurate representations of actual site conditions. It is believed that all reported data are adequately representative of site conditions and intended populations.

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0010203	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance and Internal Standard Noncompliance
29SB0010203	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0010203	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0010203	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2,4-DINITROPHENOL	UG/KG	380	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0010203	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	4,6-DINITRO-2-METHYLPHENOL	UG/KG	96	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0010203	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	4-NITROPHENOL	UG/KG	380	UJ	R	Surrogate Recovery Noncompliance
29SB0010203	ANTHRACENE	UG/KG	7.7	J	P	Uncertainty Near Detection Limit
29SB0010203	BENZO(G,H,I)PERYLENE	UG/KG	32	J	P	Uncertainty Near Detection Limit
29SB0010203	BENZO(K)FLUORANTHENE	UG/KG	24	J	P	Uncertainty Near Detection Limit
29SB0010203	DIBENZO(A,H)ANTHRACENE	UG/KG	13	J	H	Hold Time Exceedance
29SB0010203	DRO (C08-C28)	UG/KG	2200	U	A	Laboratory Blank Contamination
29SB0010203	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0010203	INDENO(1,2,3-CD)PYRENE	UG/KG	21	J	P	Uncertainty Near Detection Limit

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0010203	NAPHTHALENE	UG/KG	7.7	UJ	CH	Calibration and Hold Time Noncompliance
29SB0010203	PENTACHLOROPHENOL	UG/KG	96	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0010203	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0020406	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	2,4-DINITROPHENOL	UG/KG	390	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0020406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	98	UJ	C	Calibration Noncompliance
29SB0020406	BENZO(A)PYRENE	UG/KG	7.9	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0020406	DIBENZO(A,H)ANTHRACENE	UG/KG	7.9	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0020406	DRO (C08-C28)	UG/KG	1500	U	A	Laboratory Blank Contamination
29SB0020406	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0020406	NAPHTHALENE	UG/KG	20	UJ	CH	Calibration and Hold Time Noncompliance
29SB0020406	PENTACHLOROPHENOL	UG/KG	98	UJ	CH	Calibration and Hold Time Noncompliance
29SB0030406	1,2,4,5-TETRACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0030406	1,2-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	1,3-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0030406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0030406	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0030406	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,4-DINITROPHENOL	UG/KG	380	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0030406	2,4-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2,6-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-CHLORONAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-METHYLNAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	3-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	94	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0030406	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4-CHLOROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	4-NITROPHENOL	UG/KG	380	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	ACENAPHTHENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	ACENAPHTHYLENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	ANTHRACENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0030406	BENZO(A)ANTHRACENE	UG/KG	26	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	BENZO(A)PYRENE	UG/KG	22	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	BENZO(B)FLUORANTHENE	UG/KG	28	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	BENZO(G,H,I)PERYLENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	BENZO(K)FLUORANTHENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	CARBAZOLE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	CHRYSENE	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	DIBENZO(A,H)ANTHRACENE	UG/KG	7.6	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0030406	DIBENZOFURAN	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	FLUORANTHENE	UG/KG	49	J	R	Surrogate Recovery Noncompliance
29SB0030406	FLUORENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	HEXACHLOROBENZENE	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0030406	INDENO(1,2,3-CD)PYRENE	UG/KG	38	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	N-NITROSODIPHENYLAMINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	NAPHTHALENE	UG/KG	7.6	UJ	CH	Calibration and Hold Time Noncompliance
29SB0030406	NITROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	PENTACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0030406	PENTACHLOROPHENOL	UG/KG	94	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0030406	PHENANTHRENE	UG/KG	21	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0030406	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0030406	PYRENE	UG/KG	32	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SB0050406	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2,4-DINITROPHENOL	UG/KG	380	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0050406	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2-METHYLNAPHTHALENE	UG/KG	8.7	J	P	Uncertainty Near Detection Limit
29SB0050406	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	95	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0050406	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	4-NITROPHENOL	UG/KG	380	UJ	R	Surrogate Recovery Noncompliance
29SB0050406	CARBAZOLE	UG/KG	170	J	P	Uncertainty Near Detection Limit
29SB0050406	DIBENZOFURAN	UG/KG	84	J	P	Uncertainty Near Detection Limit
29SB0050406	DRO (C08-C28)	UG/KG	310000	J	R	Surrogate Recovery Noncompliance
29SB0050406	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0050406	NAPHTHALENE	UG/KG	11	J	P	Uncertainty Near Detection Limit

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0050406	PENTACHLOROPHENOL	UG/KG	95	UJ	CH	Calibration and Hold Time Noncompliance
29SB0050406	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SB0060206	1,2,4-TRICHLOROBENZENE	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	1,4-DICHLOROBENZENE	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	2,4,6-TRICHLOROPHENOL	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	2,4-DINITROPHENOL	UG/KG	410	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0060206	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	C	Calibration Noncompliance
29SB0060206	BENZO(A)PYRENE	UG/KG	8.3	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0060206	DIBENZO(A,H)ANTHRACENE	UG/KG	8.3	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0060206	DRO (C08-C28)	UG/KG	3900	U	A	Laboratory Blank Contamination
29SB0060206	HEXACHLOROBENZENE	UG/KG	21	UJ	H	Hold Time Exceedance
29SB0060206	NAPHTHALENE	UG/KG	8.3	UJ	CH	Calibration and Hold Time Noncompliance
29SB0060206	PENTACHLOROPHENOL	UG/KG	100	UJ	CH	Calibration and Hold Time Noncompliance
29SB0060206-D	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	2,4-DINITROPHENOL	UG/KG	410	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0060206-D	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	C	Calibration Noncompliance
29SB0060206-D	BENZO(A)PYRENE	UG/KG	8.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0060206-D	DIBENZO(A,H)ANTHRACENE	UG/KG	8.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0060206-D	DRO (C08-C28)	UG/KG	3300	U	A	Laboratory Blank Contamination
29SB0060206-D	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0060206-D	NAPHTHALENE	UG/KG	8.1	UJ	CH	Calibration and Hold Time Noncompliance
29SB0060206-D	PENTACHLOROPHENOL	UG/KG	100	UJ	CH	Calibration and Hold Time Noncompliance
29SB0070204	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	2,4-DINITROPHENOL	UG/KG	380	UJ	C	Calibration Noncompliance
29SB0070204	3-METHYLPHENOL	UG/KG	19	UJ	C	Calibration Noncompliance
29SB0070204	4,6-DINITRO-2-METHYLPHENOL	UG/KG	94	UJ	C	Calibration Noncompliance
29SB0070204	BENZO(A)PYRENE	UG/KG	8	UJ	H	Hold Time Exceedance
29SB0070204	DIBENZO(A,H)ANTHRACENE	UG/KG	8	UJ	H	Hold Time Exceedance
29SB0070204	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SB0070204	NAPHTHALENE	UG/KG	8	UJ	H	Hold Time Exceedance
29SB0070204	PENTACHLOROPHENOL	UG/KG	94	UJ	H	Hold Time Exceedance
29SB0080406	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SB0080406	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SB0080406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0080406	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0080406	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0080406	2,4-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0080406	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	ACENAPHTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	ANTHRACENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	BENZO(A)ANTHRACENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	BENZO(A)PYRENE	UG/KG	7.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0080406	BENZO(B)FLUORANTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0080406	BENZO(G,H,I)PERYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	BENZO(K)FLUORANTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	CARBAZOLE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	CHRYSENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	DIBENZO(A,H)ANTHRACENE	UG/KG	7.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SB0080406	DIBENZOFURAN	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	FLUORANTHENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	FLUORENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SB0080406	INDENO(1,2,3-CD)PYRENE	UG/KG	35	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	NAPHTHALENE	UG/KG	7.1	UJ	H	Hold Time Exceedance
29SB0080406	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0080406	PHENANTHRENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0080406	PYRENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,2,4,5-TETRACHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,2,4-TRICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0090406	1,2-DICHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,3-DICHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	1,4-DICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0090406	2,3,4,6-TETRACHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,4,5-TRICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0090406	2,4,6-TRICHLOROPHENOL	UG/KG	40	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0090406	2,4-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,4-DIMETHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,4-DINITROPHENOL	UG/KG	400	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SB0090406	2,4-DINITROTOLUENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,6-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2,6-DINITROTOLUENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-CHLORONAPHTHALENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-CHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-METHYLNAPHTHALENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-NITROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	2-NITROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	3-NITROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0090406	4-CHLORO-3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4-CHLOROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4-NITROANILINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	4-NITROPHENOL	UG/KG	400	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	ACENAPHTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	ACENAPHTHYLENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	ANTHRACENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	BENZO(A)ANTHRACENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0090406	BENZO(A)PYRENE	UG/KG	16	UJ	CH	Calibration and Hold Time Noncompliance
29SB0090406	BENZO(B)FLUORANTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	BENZO(G,H,I)PERYLENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	BENZO(K)FLUORANTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	CARBAZOLE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	CHRYSENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	DIBENZO(A,H)ANTHRACENE	UG/KG	16	UJ	CH	Calibration and Hold Time Noncompliance
29SB0090406	DIBENZOFURAN	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	FLUORANTHENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	FLUORENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	HEXACHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0090406	INDENO(1,2,3-CD)PYRENE	UG/KG	40	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	N-NITROSODIPHENYLAMINE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	NAPHTHALENE	UG/KG	16	UJ	H	Hold Time Exceedance
29SB0090406	NITROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PENTACHLOROBENZENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PENTACHLOROPHENOL	UG/KG	200	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0090406	PHENANTHRENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0090406	PYRENE	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0100204	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0100204	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0100204	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0100204	2,4-DINITROPHENOL	UG/KG	400	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SB0100204	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	C	Calibration Noncompliance
29SB0100204	BENZO(A)PYRENE	UG/KG	8.1	UJ	CH	Calibration and Hold Time Noncompliance
29SB0100204	DIBENZO(A,H)ANTHRACENE	UG/KG	8.1	UJ	CH	Calibration and Hold Time Noncompliance
29SB0100204	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SB0100204	NAPHTHALENE	UG/KG	8.1	UJ	H	Hold Time Exceedance
29SB0100204	PENTACHLOROPHENOL	UG/KG	100	UJ	CH	Calibration and Hold Time Noncompliance
29SB0110203	1,2,4-TRICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0110203	1,4-DICHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0110203	2,3,4,6-TETRACHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2,4,6-TRICHLOROPHENOL	UG/KG	40	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SB0110203	2,4-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2,4-DIMETHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2,4-DINITROPHENOL	UG/KG	400	UJ	CER	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0110203	2,6-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2-CHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	2-NITROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	4,6-DINITRO-2-METHYLPHENOL	UG/KG	100	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SB0110203	4-CHLORO-3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SB0110203	4-NITROPHENOL	UG/KG	400	UJ	R	Surrogate Recovery Noncompliance
29SB0110203	CARBAZOLE	UG/KG	170	J	P	Uncertainty Near Detection Limit
29SB0110203	DIBENZOFURAN	UG/KG	38	J	P	Uncertainty Near Detection Limit
29SB0110203	DRO (C08-C28)	UG/KG	3400	U	A	Laboratory Blank Contamination
29SB0110203	HEXACHLOROBENZENE	UG/KG	40	UJ	H	Hold Time Exceedance
29SB0110203	NAPHTHALENE	UG/KG	16	UJ	H	Hold Time Exceedance
29SB0110203	PENTACHLOROPHENOL	UG/KG	200	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SB0110203	PHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0010002	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0010002	2,4-DINITROPHENOL	UG/KG	360	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0010002	2,4-DINITROTOLUENE	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0010002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	90	UJ	C	Calibration Noncompliance
29SS0010002	ANTHRACENE	UG/KG	9.7	J	P	Uncertainty Near Detection Limit
29SS0010002	CARBAZOLE	UG/KG	12	J	P	Uncertainty Near Detection Limit
29SS0010002	DRO (C08-C28)	UG/KG	4000	U	A	Laboratory Blank Contamination
29SS0020004	1,2,4-TRICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	1,4-DICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	2,4,5-TRICHLOROPHENOL	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0020004	2,4,6-TRICHLOROPHENOL	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	2,4-DINITROPHENOL	UG/KG	350	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0020004	2,4-DINITROTOLUENE	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0020004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	87	UJ	C	Calibration Noncompliance
29SS0020004	CARBAZOLE	UG/KG	62	J	P	Uncertainty Near Detection Limit

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0020004	DIBENZO(A,H)ANTHRACENE	UG/KG	52	J	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0020004	DIBENZOFURAN	UG/KG	13	J	P	Uncertainty Near Detection Limit
29SS0020004	DRO (C08-C28)	UG/KG	12000	J	R	Surrogate Recovery Noncompliance
29SS0020004	FLUORENE	UG/KG	22	J	P	Uncertainty Near Detection Limit
29SS0020004	HEXACHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0020004	NAPHTHALENE	UG/KG	7.3	UJ	CH	Calibration and Hold Time Noncompliance
29SS0020004	PENTACHLOROPHENOL	UG/KG	87	UJ	CH	Calibration and Hold Time Noncompliance
29SS0040004	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	C	Calibration Noncompliance
29SS0040004	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	2,4-DINITROPHENOL	UG/KG	380	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0040004	2,4-DINITROTOLUENE	UG/KG	19	UJ	C	Calibration Noncompliance
29SS0040004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	94	UJ	C	Calibration Noncompliance
29SS0040004	BENZO(A)ANTHRACENE	UG/KG	35	J	P	Uncertainty Near Detection Limit
29SS0040004	BENZO(G,H,I)PERYLENE	UG/KG	36	J	P	Uncertainty Near Detection Limit
29SS0040004	BENZO(K)FLUORANTHENE	UG/KG	28	J	P	Uncertainty Near Detection Limit
29SS0040004	DIBENZO(A,H)ANTHRACENE	UG/KG	7.6	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0040004	DRO (C08-C28)	UG/KG	5700	J	R	Surrogate Recovery Noncompliance
29SS0040004	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0040004	INDENO(1,2,3-CD)PYRENE	UG/KG	34	J	P	Uncertainty Near Detection Limit
29SS0040004	NAPHTHALENE	UG/KG	7.6	UJ	CH	Calibration and Hold Time Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0040004	PENTACHLOROPHENOL	UG/KG	94	UJ	CH	Calibration and Hold Time Noncompliance
29SS0040004	PHENANTHRENE	UG/KG	24	J	P	Uncertainty Near Detection Limit
29SS0050004	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0050004	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0050004	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0050004	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0050004	2,4-DINITROPHENOL	UG/KG	350	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0050004	2,4-DINITROTOLUENE	UG/KG	18	UJ	C	Calibration Noncompliance
29SS0050004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	C	Calibration Noncompliance
29SS0050004	ACENAPHTHENE	UG/KG	25	J	P	Uncertainty Near Detection Limit
29SS0050004	CARBAZOLE	UG/KG	26	J	P	Uncertainty Near Detection Limit
29SS0050004	DIBENZO(A,H)ANTHRACENE	UG/KG	7	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0050004	DIBENZOFURAN	UG/KG	10	J	P	Uncertainty Near Detection Limit
29SS0050004	DRO (C08-C28)	UG/KG	14000	J	R	Surrogate Recovery Noncompliance
29SS0050004	FLUORENE	UG/KG	21	J	P	Uncertainty Near Detection Limit
29SS0050004	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0050004	NAPHTHALENE	UG/KG	7	UJ	CH	Calibration and Hold Time Noncompliance
29SS0050004	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0060002	1,2,4,5-TETRACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	1,2,4-TRICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0060002	1,2-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	1,3-DICHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0060002	1,4-DICHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0060002	2,3,4,6-TETRACHLOROPHENOL	UG/KG	19	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0060002	2,4,5-TRICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,4,6-TRICHLOROPHENOL	UG/KG	19	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0060002	2,4-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,4-DIMETHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,4-DINITROPHENOL	UG/KG	370	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0060002	2,4-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,6-DICHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2,6-DINITROTOLUENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-CHLORONAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-CHLOROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-METHYLNAPHTHALENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	2-NITROPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	3-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	93	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0060002	4-CHLORO-3-METHYLPHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4-CHLOROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4-NITROANILINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	4-NITROPHENOL	UG/KG	370	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0060002	ACENAPHTHENE	UG/KG	19	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0060002	ACENAPHTHYLENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	ANTHRACENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	BENZO(A)ANTHRACENE	UG/KG	51	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(A)PYRENE	UG/KG	69	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(B)FLUORANTHENE	UG/KG	160	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(G,H,I)PERYLENE	UG/KG	98	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	BENZO(K)FLUORANTHENE	UG/KG	66	J	CNR	Calibration, Internal Standard, Surrogate Recovery Noncompliance
29SS0060002	CARBAZOLE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	CHRYSENE	UG/KG	79	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	DIBENZO(A,H)ANTHRACENE	UG/KG	7.5	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0060002	DIBENZOFURAN	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	DRO (C08-C28)	UG/KG	14000	J	R	Surrogate Recovery Noncompliance
29SS0060002	FLUORANTHENE	UG/KG	59	J	R	Surrogate Recovery Noncompliance
29SS0060002	FLUORENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	HEXACHLOROBENZENE	UG/KG	19	UJ	H	Hold Time Exceedance
29SS0060002	INDENO(1,2,3-CD)PYRENE	UG/KG	71	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0060002	N-NITROSODIPHENYLAMINE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	NAPHTHALENE	UG/KG	7.5	UJ	CH	Calibration and Hold Time Noncompliance
29SS0060002	NITROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0060002	PENTACHLOROBENZENE	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	PENTACHLOROPHENOL	UG/KG	93	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0060002	PHENANTHRENE	UG/KG	37	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0060002	PHENOL	UG/KG	19	UJ	R	Surrogate Recovery Noncompliance
29SS0060002	PYRENE	UG/KG	170	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0070002	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0070002	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0070002	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0070002	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0070002	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,4-DINITROPHENOL	UG/KG	370	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0070002	2,4-DINITROTOLUENE	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0070002	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0070002	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	92	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0070002	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	4-NITROPHENOL	UG/KG	370	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	ACENAPHTHENE	UG/KG	11	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	ANTHRACENE	UG/KG	22	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	BENZO(A)ANTHRACENE	UG/KG	56	J	R	Surrogate Recovery Noncompliance
29SS0070002	BENZO(A)PYRENE	UG/KG	54	J	R	Surrogate Recovery Noncompliance
29SS0070002	BENZO(B)FLUORANTHENE	UG/KG	87	J	R	Surrogate Recovery Noncompliance
29SS0070002	BENZO(G,H,I)PERYLENE	UG/KG	36	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	BENZO(K)FLUORANTHENE	UG/KG	38	J	R	Surrogate Recovery Noncompliance
29SS0070002	CARBAZOLE	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	CHRYSENE	UG/KG	67	J	R	Surrogate Recovery Noncompliance
29SS0070002	DIBENZO(A,H)ANTHRACENE	UG/KG	7.4	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0070002	DIBENZOFURAN	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	DRO (C08-C28)	UG/KG	4900	J	R	Surrogate Recovery Noncompliance
29SS0070002	FLUORANTHENE	UG/KG	120	J	R	Surrogate Recovery Noncompliance
29SS0070002	FLUORENE	UG/KG	8.1	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0070002	INDENO(1,2,3-CD)PYRENE	UG/KG	31	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0070002	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	NAPHTHALENE	UG/KG	7.4	UJ	H	Hold Time Exceedance
29SS0070002	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	PENTACHLOROPHENOL	UG/KG	92	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0070002	PHENANTHRENE	UG/KG	100	J	R	Surrogate Recovery Noncompliance
29SS0070002	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0070002	PYRENE	UG/KG	200	J	R	Surrogate Recovery Noncompliance
29SS0080004	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0080004	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0080004	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0080004	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0080004	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0080004	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0080004	2,4-DINITROTOLUENE	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0080004	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0080004	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	ACENAPHTHENE	UG/KG	35	J	R	Surrogate Recovery Noncompliance
29SS0080004	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	ANTHRACENE	UG/KG	57	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(A)ANTHRACENE	UG/KG	140	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(A)PYRENE	UG/KG	110	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(B)FLUORANTHENE	UG/KG	180	J	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0080004	BENZO(G,H,I)PERYLENE	UG/KG	68	J	R	Surrogate Recovery Noncompliance
29SS0080004	BENZO(K)FLUORANTHENE	UG/KG	85	J	R	Surrogate Recovery Noncompliance
29SS0080004	CARBAZOLE	UG/KG	46	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0080004	CHRYSENE	UG/KG	130	J	R	Surrogate Recovery Noncompliance
29SS0080004	DIBENZO(A,H)ANTHRACENE	UG/KG	24	J	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0080004	DIBENZOFURAN	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0080004	DRO (C08-C28)	UG/KG	3400	U	A	Laboratory Blank Contamination
29SS0080004	FLUORANTHENE	UG/KG	270	J	R	Surrogate Recovery Noncompliance
29SS0080004	FLUORENE	UG/KG	28	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0080004	HEXACHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0080004	INDENO(1,2,3-CD)PYRENE	UG/KG	52	J	R	Surrogate Recovery Noncompliance
29SS0080004	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	NAPHTHALENE	UG/KG	7.1	UJ	H	Hold Time Exceedance
29SS0080004	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0080004	PHENANTHRENE	UG/KG	280	J	R	Surrogate Recovery Noncompliance
29SS0080004	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0080004	PYRENE	UG/KG	460	J	R	Surrogate Recovery Noncompliance
29SS0090004	1,2,4,5-TETRACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	1,2,4-TRICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0090004	1,2-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	1,3-DICHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0090004	1,4-DICHLOROBENZENE	UG/KG	18	UJ	H	Hold Time Exceedance
29SS0090004	2,3,4,6-TETRACHLOROPHENOL	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0090004	2,4,5-TRICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,4,6-TRICHLOROPHENOL	UG/KG	18	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0090004	2,4-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,4-DIMETHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0090004	2,4-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,6-DICHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2,6-DINITROTOLUENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-CHLORONAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-CHLOROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-METHYLNAPHTHALENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	2-NITROPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	3-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4,6-DINITRO-2-METHYLPHENOL	UG/KG	88	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0090004	4-CHLORO-3-METHYLPHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4-CHLOROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4-NITROANILINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0090004	ACENAPHTHENE	UG/KG	18	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0090004	ACENAPHTHYLENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	ANTHRACENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	BENZO(A)ANTHRACENE	UG/KG	31	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0090004	BENZO(A)PYRENE	UG/KG	38	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	BENZO(B)FLUORANTHENE	UG/KG	70	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	BENZO(G,H,I)PERYLENE	UG/KG	69	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	BENZO(K)FLUORANTHENE	UG/KG	33	J	CNPR	Calibration, Internal Standard, Surrogate Recovery Noncompliance and Uncertainty Near Detection Limit
29SS0090004	CARBAZOLE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	CHRYSENE	UG/KG	54	J	R	Surrogate Recovery Noncompliance
29SS0090004	DIBENZO(A,H)ANTHRACENE	UG/KG	7.1	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0090004	DIBENZOFURAN	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	DRO (C08-C28)	UG/KG	45000	J	R	Surrogate Recovery Noncompliance
29SS0090004	FLUORANTHENE	UG/KG	30	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0090004	FLUORENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	HEXACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	INDENO(1,2,3-CD)PYRENE	UG/KG	40	J	NR	Internal Standard and Surrogate Recovery Noncompliance
29SS0090004	N-NITROSODIPHENYLAMINE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	NAPHTHALENE	UG/KG	7.1	UJ	H	Hold Time Exceedance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0090004	NITROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	PENTACHLOROBENZENE	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	PENTACHLOROPHENOL	UG/KG	88	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0090004	PHENANTHRENE	UG/KG	26	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0090004	PHENOL	UG/KG	18	UJ	R	Surrogate Recovery Noncompliance
29SS0090004	PYRENE	UG/KG	100	J	R	Surrogate Recovery Noncompliance
29SS0100002	1,2,4,5-TETRACHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	1,2,4-TRICHLOROBENZENE	UG/KG	35	UJ	H	Hold Time Exceedance
29SS0100002	1,2-DICHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	1,3-DICHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	1,4-DICHLOROBENZENE	UG/KG	35	UJ	H	Hold Time Exceedance
29SS0100002	2,3,4,6-TETRACHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4,5-TRICHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4,6-TRICHLOROPHENOL	UG/KG	35	UJ	HR	Hold Time Exceedance and Surrogate Recovery Noncompliance
29SS0100002	2,4-DICHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4-DIMETHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,4-DINITROPHENOL	UG/KG	350	UJ	CER	Calibration, LCS/LCSD, and Surrogate Recovery Noncompliance
29SS0100002	2,4-DINITROTOLUENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,6-DICHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2,6-DINITROTOLUENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-CHLORONAPHTHALENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-CHLOROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-METHYLNAPHTHALENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0100002	2-METHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-NITROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	2-NITROPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	3-METHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	3-NITROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	87	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0100002	4-CHLORO-3-METHYLPHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4-CHLOROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4-NITROANILINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	4-NITROPHENOL	UG/KG	350	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	ACENAPHTHENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	ACENAPHTHYLENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	ANTHRACENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	BENZO(A)ANTHRACENE	UG/KG	11	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	BENZO(A)PYRENE	UG/KG	7.3	J	CPR	Calibration, Surrogate Recovery Noncompliance and Uncertainty Near Detection Limit
29SS0100002	BENZO(B)FLUORANTHENE	UG/KG	15	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	BENZO(G,H,I)PERYLENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	BENZO(K)FLUORANTHENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	CARBAZOLE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	CHRYSENE	UG/KG	8	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	DIBENZO(A,H)ANTHRACENE	UG/KG	14	UJ	CH	Calibration and Hold Time Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0100002	DIBENZOFURAN	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	DRO (C08-C28)	UG/KG	3600	U	A	Laboratory Blank Contamination
29SS0100002	FLUORANTHENE	UG/KG	20	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	FLUORENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	HEXACHLOROBENZENE	UG/KG	35	UJ	H	Hold Time Exceedance
29SS0100002	INDENO(1,2,3-CD)PYRENE	UG/KG	35	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	N-NITROSODIPHENYLAMINE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	NAPHTHALENE	UG/KG	14	UJ	H	Hold Time Exceedance
29SS0100002	NITROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	PENTACHLOROBENZENE	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	PENTACHLOROPHENOL	UG/KG	170	UJ	CHR	Calibration, Hold Time, and Surrogate Recovery Noncompliance
29SS0100002	PHENANTHRENE	UG/KG	7.3	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002	PHENOL	UG/KG	17	UJ	R	Surrogate Recovery Noncompliance
29SS0100002	PYRENE	UG/KG	10	J	PR	Uncertainty Near Detection Limit and Surrogate Recovery Noncompliance
29SS0100002-D	1,2,4-TRICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SS0100002-D	1,4-DICHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SS0100002-D	2,3,4,6-TETRACHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4,5-TRICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4,6-TRICHLOROPHENOL	UG/KG	20	UJ	H	Hold Time Exceedance
29SS0100002-D	2,4-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4-DIMETHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2,4-DINITROPHENOL	UG/KG	400	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
29SS0100002-D	2,6-DICHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0100002-D	2-CHLOROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	2-NITROPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	4,6-DINITRO-2-METHYLPHENOL	UG/KG	99	UJ	CR	Calibration and Surrogate Recovery Noncompliance
29SS0100002-D	4-CHLORO-3-METHYLPHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	4-NITROPHENOL	UG/KG	400	UJ	R	Surrogate Recovery Noncompliance
29SS0100002-D	BENZO(A)PYRENE	UG/KG	8	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0100002-D	DIBENZO(A,H)ANTHRACENE	UG/KG	8	UJ	HN	Hold Time Exceedance and Internal Standard Noncompliance
29SS0100002-D	DRO (C08-C28)	UG/KG	2600	U	A	Laboratory Blank Contamination
29SS0100002-D	HEXACHLOROBENZENE	UG/KG	20	UJ	H	Hold Time Exceedance
29SS0100002-D	NAPHTHALENE	UG/KG	8	UJ	CH	Calibration and Hold Time Noncompliance
29SS0100002-D	PENTACHLOROPHENOL	UG/KG	99	UJ	CH	Calibration and Hold Time Noncompliance
29SS0100002-D	PHENOL	UG/KG	20	UJ	R	Surrogate Recovery Noncompliance
29SS0110002	1,2,4-TRICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0110002	1,4-DICHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0110002	2,4,5-TRICHLOROPHENOL	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0110002	2,4,6-TRICHLOROPHENOL	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0110002	2,4-DINITROPHENOL	UG/KG	350	UJ	C	Calibration Noncompliance
29SS0110002	2,4-DINITROTOLUENE	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0110002	3-METHYLPHENOL	UG/KG	17	UJ	C	Calibration Noncompliance
29SS0110002	4,6-DINITRO-2-METHYLPHENOL	UG/KG	87	UJ	C	Calibration Noncompliance
29SS0110002	ACENAPHTHENE	UG/KG	7.3	J	P	Uncertainty Near Detection Limit

TABLE 1

QUALIFIED DATA FOR SOIL SAMPLES
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE ID	PARAMETER	UNITS	SAMPLE RESULT	VALIDATION QUALIFIER	QUALIFICATION CODE	REASON FOR QUALIFICATION
29SS0110002	ANTHRACENE	UG/KG	19	J	P	Uncertainty Near Detection Limit
29SS0110002	BENZO(A)ANTHRACENE	UG/KG	63	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(A)PYRENE	UG/KG	65	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(B)FLUORANTHENE	UG/KG	130	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(G,H,I)PERYLENE	UG/KG	41	J	N	Internal Standard Noncompliance
29SS0110002	BENZO(K)FLUORANTHENE	UG/KG	43	J	N	Internal Standard Noncompliance
29SS0110002	CARBAZOLE	UG/KG	14	J	P	Uncertainty Near Detection Limit
29SS0110002	CHRYSENE	UG/KG	81	J	N	Internal Standard Noncompliance
29SS0110002	DIBENZO(A,H)ANTHRACENE	UG/KG	24	J	H	Hold Time Exceedance
29SS0110002	DRO (C08-C28)	UG/KG	3700	J	R	Surrogate Recovery Noncompliance
29SS0110002	HEXACHLOROBENZENE	UG/KG	17	UJ	H	Hold Time Exceedance
29SS0110002	INDENO(1,2,3-CD)PYRENE	UG/KG	36	J	N	Internal Standard Noncompliance
29SS0110002	NAPHTHALENE	UG/KG	7	UJ	H	Hold Time Exceedance
29SS0110002	PENTACHLOROPHENOL	UG/KG	87	UJ	H	Hold Time Exceedance
29SS0110002	PYRENE	UG/KG	230	J	N	Internal Standard Noncompliance

TABLE 2

RANGE OF NONDETECT VALUES FOR SOIL SAMPLES
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Parameter	Lowest Risk-Based Criterion	Range of Nondetect Values (µg/kg)	Comments (excludes two field duplicates)
PENTACHLOROPHENOL	28	87 - 200	Three LODs greater than 100 ug/kg
1,4-DICHLOROBENZENE	8.2	17 - 40	Three LODs greater than 25 ug/kg
2,4-DIMETHYLPHENOL	10	17 - 21	Five LODs greater than 19 ug/kg
2-CHLORONAPHTHALENE	12.2	17 - 21	Five LODs greater than 19 ug/kg
4-CHLOROANILINE	2.8	17 - 21	All LODs greater than 10 ug/kg
BENZO(A)PYRENE	15	7.1 - 16	One LOD greater than 15 ug/kg
DIBENZO(A,H)ANTHRACENE	15	7.0 - 36	Two LODs greater than 15 ug/kg
HEXACHLOROBENZENE	10.6	17 - 40	Three LODs greater than 25 ug/kg
NAPHTHALENE	9.4	7.0 - 20	One LOD greater than 18 ug/kg
NITROBENZENE	1.58	17 - 21	All LODs greater than 5 ug/kg

APPENDIX E

SUPPORTING DOCUMENTATION
FOR THE HUMAN HEALTH RISK ASSESSMENT

APPENDIX E.1

SAMPLES USED IN RISK ASSESSMENT

TABLE 1
SAMPLES USED IN THE HUMAN HEALTH RISH ASSESSMENT

Surface Soil	Subsurface Soil
29SS0010002	29SB0010203
29SS0020004	29SB0020406
29SS0040004	29SB0030406
29SS0050004	29SB0050406
29SS0060002	29SB0060206
29SS0070002	29SB0060206-D
29SS0080004	29SB0070204
29SS0090004	29SB0080406
29SS0100002	29SB0090406
29SS0100002-D	29SB0100204
29SS0110002	29SB0110203

APPENDIX E.2

RAGS-PART D TABLES

RAGS Part D Table 1

Selection of Exposure Pathways

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE INDIANA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	SWMU 29	Construction Worker	Adult	Ingestion Dermal	Quant Quant	Construction workers may contact surface soil during normal work activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Adolescent trespassers may contact surface soil while at the site.
		Air	SWMU 29	Construction Worker	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during work activities.
				Trespassers	Adolescent	Inhalation	Quant	Adolescent trespassers may be exposed to fugitive dust and volatile emissions while at the site.
	Subsurface Soil	Subsurface Soil	SWMU 29	Construction Worker	Adult	Ingestion Dermal	Quant Quant	Construction workers may contact subsurface soil during normal work activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Although industrial workers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Although adolescent trespassers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
		Air	SWMU 29	Construction Worker	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Although industrial workers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Inhalation	Quant	Although adolescent trespassers are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
Future	Surface Soil	Surface Soil	SWMU 29	Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
				Recreational Users	Child	Ingestion Dermal	Quant Quant	A future child recreational user may be exposed to surface soil.
					Adult	Ingestion Dermal	Quant Quant	A future adult recreational user may be exposed to surface soil.
		Air	SWMU 29	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE INDIANA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Subsurface Soil	Subsurface Soil	SWMU 29	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Recreational Users	Child	Inhalation	Quant	Although child recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although adult recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
	Subsurface Soil	Air	SWMU 29	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Recreational Users	Child	Inhalation	Quant	Although child recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	Although adult recreational users are not expected to be exposed to subsurface soil this scenario is included to aid in future risk management decisions.

Notes:
Quant - Quantitative.

RAGS Part D Table 2

Occurrence, Distribution and Selection Of Chemicals of Potential Concern

LIST OF TABLES

RAGS PART D TABLE 2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Table No.

TABLE 2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	Adjusted USEPA RSL Residential Soil[5]	IDEM Residential Soil Direct[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
SWMU 29	**Semivolatile Organic Compounds**													
	83-32-9	Acenaphthene	7.3 J	36	ug/kg	29SS0020004	5/10	17 - 20	36	NA	340,000 N	9,500,000 N	No	BSL
	120-12-7	Anthracene	9.7 J	75	ug/kg	29SS0020004	6/10	17 - 20	75	NA	1,700,000 N	47,000,000 N	No	BSL
	56-55-3	Benzo(a)anthracene	11 J	280	ug/kg	29SS0020004	10/10	20 - 20	280	NA	150 C	5,000 C	Yes	ASL
	50-32-8	Benzo(a)pyrene	7.3 J	320	ug/kg	29SS0020004	10/10	8 - 8	320	NA	15 C	500 C	Yes	ASL
	205-99-2	Benzo(b)fluoranthene	15 J	500	ug/kg	29SS0020004	10/10	20 - 20	500	NA	150 C	5,000 C	Yes	ASL
	191-24-2	Benzo(g,h,i)perylene	36 J	180	ug/kg	29SS0020004	9/10	17 - 20	180	NA	170,000 N[8]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	28 J	150	ug/kg	29SS0020004	9/10	17 - 20	150	NA	1,500 C	50,000 C	No	BSL
	86-74-8	Carbazole	12 J	62 J	ug/kg	29SS0020004	6/10	17 - 20	62	NA	NA	210,000 C	No	BSL
	218-01-9	Chrysene	8 J	320	ug/kg	29SS0020004	10/10	20 - 20	320	NA	15,000 C	500,000 C	No	BSL
	53-70-3	Dibenzo(a,h)anthracene	24 J	52 J	ug/kg	29SS0020004	3/10	7 - 36	52	NA	15 C	500 C	Yes	ASL
	132-64-9	Dibenzofuran	10 J	15 J	ug/kg	29SS0080004	3/10	17 - 20	15	NA	7,800 N	370,000 N	No	BSL
	206-44-0	Fluoranthene	20 J	540	ug/kg	29SS0020004	10/10	20 - 20	540	NA	230,000 N	6,300,000 N	No	BSL
	86-73-7	Fluorene	8.1 J	28 J	ug/kg	29SS0080004	4/10	17 - 20	28	NA	230,000 N	6,300,000 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	31 J	150	ug/kg	29SS0020004	9/10	35 - 40	150	NA	150 C	5,000 C	No	BSL
	85-01-8	Phenanthrene	7.3 J	390	ug/kg	29SS0020004	10/10	20 - 20	390	NA	170,000 N[8]	470,000 N	No	BSL
	129-00-0	Pyrene	10 J	1,100	ug/kg	29SS0020004	10/10	20 - 20	1,100	NA	170,000 N	4,700,000 N	No	BSL
	Petroleum Hydrocarbons													
	--	DRO (C08-C28)	3,700 J	45,000 J	ug/kg	29SS0090004	7/10	2600 - 4000	45,000	NA	NA	3,100,000	No	BSL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) residential direct contact for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples

29SS0010002	29SS0080004
29SS0020004	29SS0090004
29SS0040004	29SS0100002
29SS0050004	29SS0100002-D
29SS0060002	29SS0110002
29SS0070002	

TABLE 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	USEPA RSL Protection of Groundwater[5]	IDEM Migration to Groundwater[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
PCP Drip Tank	**Semivolatile Organic Compounds**													
	83-32-9	Acenaphthene	7.3 J	36	ug/kg	29SS0020004	5/10	17 - 20	36	NA	82,000	130,000 N	No	BSL
	120-12-7	Anthracene	9.7 J	75	ug/kg	29SS0020004	6/10	17 - 20	75	NA	840,000	2,700,000 N	No	BSL
	56-55-3	Benzo(a)anthracene	11 J	280	ug/kg	29SS0020004	10/10	20 - 20	280	NA	200	19,000 C	Yes	ASL
	50-32-8	Benzo(a)pyrene	7.3 J	320	ug/kg	29SS0020004	10/10	8 - 8	320	NA	70	8,200 MCL	Yes	ASL
	205-99-2	Benzo(b)fluoranthene	15 J	500	ug/kg	29SS0020004	10/10	20 - 20	500	NA	700	57,000 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	36 J	180	ug/kg	29SS0020004	9/10	17 - 20	180	NA	190,000 [8]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	28 J	150	ug/kg	29SS0020004	9/10	17 - 20	150	NA	7,000	570,000 C	No	BSL
	86-74-8	Carbazole	12 J	62 J	ug/kg	29SS0020004	6/10	17 - 20	62	NA	NA	5,900 C	No	BSL
	218-01-9	Chrysene	8 J	320	ug/kg	29SS0020004	10/10	20 - 20	320	NA	22,000	1,900,000 C	No	BSL
	53-70-3	Dibenzo(a,h)anthracene	24 J	52 J	ug/kg	29SS0020004	3/10	7 - 36	52	NA	220	18,000 C	No	BSL
	132-64-9	Dibenzofuran	10 J	15 J	ug/kg	29SS0080004	3/10	17 - 20	15	NA	2,200	4,900 N	No	BSL
	206-44-0	Fluoranthene	20 J	540	ug/kg	29SS0020004	10/10	20 - 20	540	NA	1,400,000	6,300,000 N	No	BSL
	86-73-7	Fluorene	8.1 J	28 J	ug/kg	29SS0080004	4/10	17 - 20	28	NA	80,000	170,000 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	31 J	150	ug/kg	29SS0020004	9/10	35 - 40	150	NA	2,400	160,000 C	No	BSL
	85-01-8	Phenanthrene	7.3 J	390	ug/kg	29SS0020004	10/10	20 - 20	390	NA	190,000 [8]	13,000 N	No	BSL
	129-00-0	Pyrene	10 J	1,100	ug/kg	29SS0020004	10/10	20 - 20	1,100	NA	190,000	4,600,000 N	No	BSL
	Petroleum Hydrocarbons													
	- -	DRO (C08-C28)	3,700 J	45,000 J	ug/kg	29SS0090004	7/10	2600 - 4000	45,000	NA	NA	230,000	No	BSL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. Values are based on a dilution attenuation factor of 20.
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) migration to groundwater for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples
29SS0010002
29SS0020004
29SS0040004
29SS0050004
29SS0060002
29SS0070002
29SS0080004
29SS0090004
29SS0100002
29SS0100002-D
29SS0110002

TABLE 2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	Adjusted USEPA RSL Residential Soil[5]	IDEM Residential Soil Direct[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
SWMU 29	**Semivolatile Organic Compounds**													
	91-57-6	2-Methylnaphthalene	8.7 J	8.7 J	ug/kg	29SB0050406	1/10	18 - 21	8.7	NA	31,000 N	630,000 N	No	BSL
	83-32-9	Acenaphthene	130	160	ug/kg	29SB0050406	2/10	18 - 21	160	NA	340,000 N	9,500,000 N	No	BSL
	120-12-7	Anthracene	7.7 J	260	ug/kg	29SB0050406, 29SB0110203	3/10	18 - 21	260	NA	1,700,000 N	47,000,000 N	No	BSL
	56-55-3	Benzo(a)anthracene	26 J	640	ug/kg	29SB0110203	4/10	18 - 21	640	NA	150 C	5,000 C	Yes	ASL
	50-32-8	Benzo(a)pyrene	22 J	540	ug/kg	29SB0110203	4/10	7.1 - 16	540	NA	15 C	500 C	Yes	ASL
	205-99-2	Benzo(b)fluoranthene	28 J	690	ug/kg	29SB0110203	4/10	18 - 21	690	NA	150 C	5,000 C	Yes	ASL
	191-24-2	Benzo(g,h,i)perylene	32 J	260	ug/kg	29SB0110203	3/10	18 - 21	260	NA	170,000 N[8]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	24 J	280	ug/kg	29SB0110203	3/10	18 - 21	280	NA	1,500 C	50,000 C	No	BSL
	86-74-8	Carbazole	170 J	170 J	ug/kg	29SB0050406, 29SB0110203	2/10	18 - 21	170	NA	NA	210,000 C	No	BSL
	218-01-9	Chrysene	15 J	610	ug/kg	29SB0110203	4/10	18 - 21	610	NA	15,000 C	500,000 C	No	BSL
	53-70-3	Dibenzo(a,h)anthracene	13 J	86	ug/kg	29SB0050406	3/10	7.1 - 16	86	NA	15 C	500 C	Yes	ASL
	132-64-9	Dibenzofuran	38 J	84 J	ug/kg	29SB0050406	2/10	18 - 21	84	NA	7,800 N	370,000 N	No	BSL
	206-44-0	Fluoranthene	49 J	1,700	ug/kg	29SB0110203	4/10	18 - 21	1,700	NA	230,000 N	6,300,000 N	No	BSL
	86-73-7	Fluorene	120	170	ug/kg	29SB0050406	2/10	18 - 21	170	NA	230,000 N	6,300,000 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	21 J	240	ug/kg	29SB0110203	3/10	35 - 41	240	NA	150 C	5,000 C	Yes	ASL
	91-20-3	Naphthalene	11 J	11 J	ug/kg	29SB0050406	1/10	7.1 - 20	11	NA	3,600 C	3,200,000 N	No	BSL
	85-01-8	Phenanthrene	21 J	1,000	ug/kg	29SB0050406, 29SB0110203	4/10	18 - 21	1,000	NA	170,000 N[8]	470,000 N	No	BSL
	129-00-0	Pyrene	32 J	1,000	ug/kg	29SB0110203	4/10	18 - 21	1,000	NA	170,000 N	4,700,000 N	No	BSL
	Petroleum Hydrocarbons													
	- -	DRO (C08-C28)	4,700	310,000 J	ug/kg	29SB0050406	6/10	1500 - 3900	310,000	NA	NA	3,100,000	No	BSL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) residential direct contact for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples

29SB0010203	29SB0060206-D	29SB0110203
29SB0020406	29SB0070204	
29SB0030406	29SB0080406	
29SB0050406	29SB0090406	
29SB0060206	29SB0100204	

TABLE 2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	USEPA RSL Protection of Groundwater[5]	IDEM Migration to Groundwater[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
SWMU 29	**Semivolatile Organic Compounds**													
	91-57-6	2-Methylnaphthalene	8.7 J	8.7 J	ug/kg	29SB0050406	1/10	18 - 21	8.7	NA	2,800	3,100 N	No	BSL
	83-32-9	Acenaphthene	130	160	ug/kg	29SB0050406	2/10	18 - 21	160	NA	82,000	130,000 N	No	BSL
	120-12-7	Anthracene	7.7 J	260	ug/kg	29SB0050406, 29SB0110203	3/10	18 - 21	260	NA	840,000	2,700,000 N	No	BSL
	56-55-3	Benzo(a)anthracene	26 J	640	ug/kg	29SB0110203	4/10	18 - 21	640	NA	200	19,000 C	Yes	ASL
	50-32-8	Benzo(a)pyrene	22 J	540	ug/kg	29SB0110203	4/10	7.1 - 16	540	NA	70	8,200 MCL	Yes	ASL
	205-99-2	Benzo(b)fluoranthene	28 J	690	ug/kg	29SB0110203	4/10	18 - 21	690	NA	700	57,000 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	32 J	260	ug/kg	29SB0110203	3/10	18 - 21	260	NA	190,000 [8]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	24 J	280	ug/kg	29SB0110203	3/10	18 - 21	280	NA	7,000	570,000 C	No	BSL
	86-74-8	Carbazole	170 J	170 J	ug/kg	29SB0050406, 29SB0110203	2/10	18 - 21	170	NA	NA	5,900 C	No	BSL
	218-01-9	Chrysene	15 J	610	ug/kg	29SB0110203	4/10	18 - 21	610	NA	22,000	1,900,000 C	No	BSL
	53-70-3	Dibenzo(a,h)anthracene	13 J	86	ug/kg	29SB0050406	3/10	7.1 - 16	86	NA	220	18,000 C	No	BSL
	132-64-9	Dibenzofuran	38 J	84 J	ug/kg	29SB0050406	2/10	18 - 21	84	NA	2,200	4,900 N	No	BSL
	206-44-0	Fluoranthene	49 J	1700	ug/kg	29SB0110203	4/10	18 - 21	1700	NA	1,400,000	6,300,000 N	No	BSL
	86-73-7	Fluorene	120	170	ug/kg	29SB0050406	2/10	18 - 21	170	NA	80,000	170,000 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	21 J	240	ug/kg	29SB0110203	3/10	35 - 41	240	NA	2,400	160,000 C	No	BSL
	91-20-3	Naphthalene	11 J	11 J	ug/kg	29SB0050406	1/10	7.1 - 20	11	NA	9.4	700 N	Yes	ASL
	85-01-8	Phenanthrene	21 J	1,000	ug/kg	29SB0050406, 29SB0110203	4/10	18 - 21	1,000	NA	190,000 [8]	13,000 N	No	BSL
	129-00-0	Pyrene	32 J	1,000	ug/kg	29SB0110203	4/10	18 - 21	1,000	NA	190,000	4,600,000 N	No	BSL
	Petroleum Hydrocarbons													
	--	DRO (C08-C28)	4,700	310,000 J	ug/kg	29SB0050406	6/10	1500 - 3900	310,000	NA	NA	230,000	Yes	ASL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - No background data is available.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. Values are based on a dilution attenuation factor of 20.
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) migration to groundwater for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples

29SB0010203	29SB0070204
29SB0020406	29SB0080406
29SB0030406	29SB0090406
29SB0050406	29SB0100204
29SB0060206	29SB0110203
29SB0060206-D	

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

LIST OF TABLES
RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
SWMU 29	Benzo(a)anthracene	mg/kg	0.085	0.15 (G)	0.28	0.15	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.00
	Benzo(a)pyrene	mg/kg	0.089	0.16 (G)	0.32	0.16	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.00
	Benzo(b)fluoranthene	mg/kg	0.15	0.26 (G)	0.5	0.26	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.00
	Dibenzo(a,h)anthracene	mg/kg	0.014	0.033 (NP)	0.052 J	0.033	mg/kg	95% KM (t) UCL	ProUCL 4.1.00

Notes:
G = Gamma
NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
SWMU 29	Benzo(a)anthracene	mg/kg	0.12	0.27 (N)	0.64	0.27	mg/kg	95% KM (t) UCL	ProUCL 4.1.00
	Benzo(a)pyrene	mg/kg	0.10	0.24 (N)	0.54	0.24	mg/kg	95% KM (t) UCL	ProUCL 4.1.00
	Benzo(b)fluoranthene	mg/kg	0.14	0.31 (N)	0.69	0.31	mg/kg	95% KM (t) UCL	ProUCL 4.1.00
	Dibenzo(a,h)anthracene	mg/kg	0.021	0.047 (N)	0.086	0.047	mg/kg	95% KM (t) UCL	ProUCL 4.1.00
	Indeno(1,2,3-cd)pyrene	mg/kg	0.055	0.11 (N)	0.24	0.11	mg/kg	95% KM (t) UCL	ProUCL 4.1.00

Notes:
N = Normal

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

RAGS Part D Table 4

Values Used For Daily Intake Calculations

LIST OF TABLES
RAGS PART D TABLE 4
VALUES USED FOR DAILY INTAKE CALCULATIONS

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS- SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	330	mg/day	USEPA, 2002b	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume a 30 week construction project.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.77E-08 Cancer Dermal Intake = 8.30E-08

Noncancer Ingestion Intake = 1.94E-06 Noncancer Dermal Intake = 5.81E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.34E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	

Notes:

1 - Professional judgment. Assume a 30 week construction project.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.96E-03 Noncancer Inhalation Intake = 1.37E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 2002b	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	25	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	25	years	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.49E-07 Cancer Dermal Intake = 2.31E-06

Noncancer Ingestion Intake = 9.78E-07 Noncancer Dermal Intake = 6.46E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Workers	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	250	days/year	USEPA, 2002a	
				ED	Exposure Duration	25	years	USEPA, 2002a	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA 2008	

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 8.15E-02

Noncancer Inhalation Intake = 2.28E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SOILS

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3820	cm2	(3)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	

Notes:

For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

1 - Assume one day a week in warm weather months for RME and one day every other week for CTE.

2 - Older child from age 6 to 17.

3 - Assumes 25 percent of total body surface area is exposed.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.37E-08 Cancer Dermal Intake = 1.81E-07

Noncancer Ingestion Intake = 1.66E-07 Noncancer Dermal Intake = 1.27E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespassers	Adolescent	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	10	years	(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

1 - Professional judgment.

2 - Assume one day a week in warm weather months for RME and one day every other week for CTE.

3 - Older child from age 6 to 17.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.70E-03 Noncancer Inhalation Intake = 1.19E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	-	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	-	
				SA	Skin Surface Available for Contact	3,300	cm2	(4)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	

Notes:

1 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 8.14E-08 Cancer Dermal Intake (Age 0 - 6) = 5.37E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 2.71E-08 Cancer Dermal Intake (Age 0 - 2) = 1.79E-07

Cancer Ingestion Intake (Age 2 - 6) = 5.43E-08 Cancer Dermal Intake (Age 2 - 6) = 3.58E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-07 Noncancer Dermal Intake = 6.27E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Child	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	$CA = (1/PEF + 1/VF) \times Cs$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 2.04E-03 Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 6.78E-04

Cancer Inhalation Intake (Age 2 - 6) = 1.36E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from Ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	9,070	cm2	(4)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume that head, arms, hands, lower legs, and feet are exposed, U.S. EPA, 1997.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 3.49E-08 Cancer Dermal Intake (Age 6 - 30) = 4.43E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.45E-08 Cancer Dermal Intake (Age 6 - 16) = 1.85E-07

Cancer Ingestion Intake Age 16 - 30) = 2.04E-08 Cancer Dermal Intake (Age 16 - 30) = 2.58E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.02E-07 Noncancer Dermal Intake = 1.29E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 8.14E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 3.39E-03

Cancer Inhalation Intake (Age 16 - 30) = 4.75E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.10E-06 Cancer Dermal Intake (Age 0 - 6) = 3.07E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.65E-07 Cancer Dermal Intake (Age 0 - 2) = 1.02E-06

Cancer Ingestion Intake (Age 2 - 6) = 7.31E-07 Cancer Dermal Intake (Age 2 - 6) = 2.05E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 3.58E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	CA x ET x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA 2008	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 8.22E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.92E+00

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 2.74E-02

Cancer Inhalation Intake (Age 2 - 6) = 5.48E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 4.70E-07 Cancer Dermal Intake (Age 6 - 30) = 1.87E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.96E-07 Cancer Dermal Intake (Age 6 - 16) = 7.81E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.74E-07 Cancer Dermal Intake (Age 16 - 30) = 1.09E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.37E-06 Noncancer Dermal Intake = 5.47E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.14.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 3.29E-01

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.37E-01

Cancer Inhalation Intake (Age 16 - 30) = 1.92E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.1.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	165	mg/day	(1)	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2002b	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.1	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 6.92E-09 Cancer Dermal Intake = 1.38E-08

Noncancer Ingestion Intake = 4.84E-07 Noncancer Dermal Intake = 9.69E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	$CA = (1/PEF + 1/VF) \times Cs$
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.34E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 9.78E-04 Noncancer Inhalation Intake = 6.85E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	219	days/year	USEPA, 1993	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.02	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	219	days/year	USEPA, 1993	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 5.51E-08

Noncancer Ingestion Intake = 4.29E-07

Cancer Dermal Intake = 7.27E-08

Noncancer Dermal Intake = 5.66E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Workers	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	219	days/year	USEPA, 2002a	
				ED	Exposure Duration	9	years	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 2.57E-02 Noncancer Inhalation Intake = 2.00E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADOLESCENT TRESPASSERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CSs x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	13	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3820	cm2	(3)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	13	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	

Notes:

1 - Assume one day a week in warm weather months for RME and one day every other week for CTE.

2 - Older child from age 6 to 17.

3 - Assumes 25 percent of total body surface area is exposed.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 5.92E-09 Cancer Dermal Intake = 1.81E-08

Noncancer Ingestion Intake = 4.14E-08 Noncancer Dermal Intake = 1.27E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADOLESCENT TRESPASSERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespassers	Adolescent	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	2	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	13	days/year	(2)	
				ED	Exposure Duration	10	years	(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume one day a week in warm weather months for RME and one day every other week for CTE.

3 - Older child from age 6 to 17.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 4.24E-04 Noncancer Inhalation Intake = 2.97E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.7.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CSs x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	USEPA, 1989	
				ED2	Exposure Duration (Age 2 - 6)	1	years	USEPA, 1989	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3,300	cm2	(4)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	USEPA, 1989	
				ED2	Exposure Duration (Age 2 - 6)	1	years	USEPA, 1989	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 6.78E-09 Cancer Dermal Intake = 1.79E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.39E-09 Cancer Dermal Intake (Age 0 - 2) = 8.95E-09

Cancer Ingestion Intake (Age 2 - 6) = 3.39E-09 Cancer Dermal Intake (Age 2 - 6) = 8.95E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.37E-07 Noncancer Dermal Intake = 6.27E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.8.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Child	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	2	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	26	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.70E-04 Noncancer Inhalation Intake = 5.94E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 8.48E-05

Cancer Inhalation Intake (Age 2 - 6) = 8.48E-05

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.9.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	9,070	cm2	(4)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume that head, arms, hands, lower legs, and feet are exposed, U.S. EPA, 1997.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.54E-09 Cancer Dermal Intake = 9.23E-09

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 7.27E-10 Cancer Dermal Intake (Age 6 - 16) = 2.64E-09

Cancer Ingestion Intake Age 16 - 30) = 1.82E-09 Cancer Dermal Intake (Age 16 - 30) = 6.59E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.54E-08 Noncancer Dermal Intake = 9.23E-08

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	2	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	26	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(3), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment. Assume four days a week in warm weather months for RME and two days a week for CTE.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 5.94E-04

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 5.94E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.70E-04

Cancer Inhalation Intake (Age 16 - 30) = 4.24E-04

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 1.22E-07 Cancer Dermal Intake = 1.37E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 6.11E-08 Cancer Dermal Intake (Age 0 - 2) = 6.84E-08

Cancer Ingestion Intake (Age 2 - 6) = 6.11E-08 Cancer Dermal Intake (Age 2 - 6) = 6.84E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.27E-06 Noncancer Dermal Intake = 4.79E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS TO AIR
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1993	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 1994: USEPA Region I Risk Updates, August 1994.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.83E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 9.16E-03

Cancer Inhalation Intake (Age 2 - 6) = 9.16E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 29	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 4.58E-08 Cancer Dermal Intake = 5.22E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.31E-08 Cancer Dermal Intake (Age 6 - 16) = 1.49E-08

Cancer Ingestion Intake (Age 16 - 30) = 3.27E-08 Cancer Dermal Intake (Age 16 - 30) = 3.73E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.58E-07 Noncancer Dermal Intake = 5.22E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.14.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	SWMU 29	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1993	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.316E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.81	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 6.41E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.83E-02

Cancer Inhalation Intake (Age 16 - 30) = 4.58E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from Ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

RAGS Part D Table 5

Non-Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 5
NON-CANCER TOXICITY DATA

Table No.

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds										
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

Definitions:

NA = Not Available.

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds									
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - Extrapolated RfD = RfC *20m^3/day / 70 kg

Definitions:
NA = Not Applicable

RAGS Part D Table 6

Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 6
CANCER TOXICITY DATA

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds								
Benzo(a)anthracene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(a)pyrene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	2/1/2012
Benzo(b)fluoranthene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Dibenzo(a,h)anthracene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Indeno(1,2,3-cd)pyrene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.
3 - Carcinogenic PAHs are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

IRIS = Integrated Risk Information System.

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compounds							
Benzo(a)anthracene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(a)pyrene[2]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(b)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Dibenzo(a,h)anthracene[2]	1.2E-03	$(ug/m^3)^{-1}$	4.2E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Indeno(1,2,3-cd)pyrene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Carcinogenic PAHs and are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	4.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-09	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	4.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-08	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	7.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.3E-09	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	9.1E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-09	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.7E-08					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	1.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-09	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	2.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-09	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	3.6E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-09	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-08					--
		Exposure Point Total									6.6E-08					--
	Exposure Medium Total										6.6E-08					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-7	mg/m^3	2.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-11	1.5E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-7	mg/m^3	2.3E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.6E-10	1.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.9E-7	mg/m^3	3.8E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-11	2.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-8	mg/m^3	4.8E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.8E-11	3.4E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.8E-10					--
		Exposure Point Total									3.8E-10					--
	Exposure Medium Total										3.8E-10					--
Medium Total											6.6E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	7.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.5E-09	5.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	6.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.8E-08	4.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	8.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.3E-09	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	1.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.5E-09	9.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	3.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-09	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.2E-08					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	2.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-09	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	2.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-08	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	3.3E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-09	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	5.1E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.7E-09	3.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	1.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-10	8.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.8E-08					--
		Exposure Point Total									1.0E-07					--
	Exposure Medium Total										1.0E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.0E-7	mg/m^3	3.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.3E-11	2.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-7	mg/m^3	3.5E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.9E-10	2.5E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.3E-7	mg/m^3	4.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.0E-11	3.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.5E-8	mg/m^3	6.9E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	8.2E-11	4.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.2E-8	mg/m^3	1.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-11	1.1E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.8E-10					--
		Exposure Point Total									5.8E-10					--
	Exposure Medium Total										5.8E-10					--
Medium Total											1.0E-07					--
										Total of Receptor Risks Across All Media	1.7E-07			Total of Receptor Hazards Across All Media		--

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	5.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	5.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-07	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	9.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.6E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.4E-08	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.0E-07					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	4.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-08	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	7.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.7E-08	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	9.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.2E-08	2.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.1E-07					--
		Exposure Point Total									1.1E-06					--
	Exposure Medium Total										1.1E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	9.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-12	2.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	9.9E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-11	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	1.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-12	4.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	2.0E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.5E-12	5.7E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-11					--
		Exposure Point Total									1.6E-11					--
	Exposure Medium Total										1.6E-11					--
Medium Total											1.1E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	9.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-08	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	8.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-07	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-08	3.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	1.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	4.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	3.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.1E-07					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	8.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.9E-08	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	7.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.3E-07	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	9.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.8E-08	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	1.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-07	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	3.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-08	9.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.8E-07					--
		Exposure Point Total									1.7E-06					--
	Exposure Medium Total										1.7E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-12	4.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	1.5E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.6E-11	4.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	1.9E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-12	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	2.9E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.5E-12	8.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	6.8E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.5E-13	1.9E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.5E-11					--
		Exposure Point Total									2.5E-11					--
	Exposure Medium Total										2.5E-11					--
Medium Total											1.7E-06					--
										Total of Receptor Risks Across All Media	2.8E-06			Total of Receptor Hazards Across All Media		--

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	1.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.8E-09	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.3E-08	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	4.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-08	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-07					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	1.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.7E-09	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.2E-08	2.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	4.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-08	5.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-07					--
		Exposure Point Total									2.4E-07					--
	Exposure Medium Total										2.4E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	5.8E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.4E-14	1.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	6.2E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	6.8E-13	1.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	1.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	2.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	1.3E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.5E-13	3.0E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.0E-12					--
		Exposure Point Total									1.0E-12					--
	Exposure Medium Total										1.0E-12					--
Medium Total											2.4E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	4.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	3.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-08	7.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	7.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.7E-09	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-07					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	4.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	3.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-08	7.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	7.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.7E-09	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-07					--
		Exposure Point Total									3.7E-07					--
	Exposure Medium Total										3.7E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	9.3E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.0E-12	2.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	1.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-13	2.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	1.8E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.2E-13	4.2E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	4.3E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.7E-14	9.9E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-12					--
		Exposure Point Total									1.5E-12					--
	Exposure Medium Total										1.5E-12					--
Medium Total											3.7E-07					--
										Total of Receptor Risks Across All Media	6.1E-07			Total of Receptor Hazards Across All Media		--

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	6.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.8E-08	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	6.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-07	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.2E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-07	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.4E-07					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	5.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.1E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	6.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.4E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	9.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.1E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.0E-08	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.4E-07					--
		Exposure Point Total									1.4E-06					--
	Exposure Medium Total										1.4E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	1.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-13	2.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	1.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.5E-12	2.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	2.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-13	4.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	2.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.3E-13	6.0E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-12					--
		Exposure Point Total									2.2E-12					--
	Exposure Medium Total										2.2E-12					--
Medium Total											1.4E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.6E-08	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.6E-07	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.8E-08	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	2.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-07	4.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	4.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-08	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-06					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.3E-08	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	8.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.5E-07	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.4E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	1.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	4.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	9.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.7E-07					--
		Exposure Point Total									2.1E-06					--
	Exposure Medium Total										2.1E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-13	4.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	2.0E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.2E-12	4.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	2.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-13	5.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	3.9E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.7E-13	8.5E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	9.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-13	2.0E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.3E-12					--
		Exposure Point Total									3.3E-12					--
	Exposure Medium Total										3.3E-12					--
Medium Total											2.1E-06					--
										Total of Receptor Risks Across All Media	3.5E-06			Total of Receptor Hazards Across All Media		--

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	9.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-09	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-08	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	2.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-08	3.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-07					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	1.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	2.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-08	4.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	3.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-08	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-07					--
		Exposure Point Total									2.9E-07					--
	Exposure Medium Total										2.9E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	1.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-13	2.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	1.8E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.0E-12	2.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	2.9E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-13	4.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	3.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.5E-13	6.0E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.0E-12					--
		Exposure Point Total									3.0E-12					--
	Exposure Medium Total										3.0E-12					--
Medium Total											2.9E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	2.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	3.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-08	4.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	7.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-07					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	2.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	4.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	2.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-07	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	3.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-08	5.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	5.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-08	7.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.5E-09	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-07					--
		Exposure Point Total									4.4E-07					--
	Exposure Medium Total										4.4E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	3.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.4E-13	4.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	2.7E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.0E-12	4.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	3.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.9E-13	5.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	5.3E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	6.4E-13	8.5E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	1.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-13	2.0E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.5E-12					--
		Exposure Point Total									4.5E-12					--
	Exposure Medium Total										4.5E-12					--
Medium Total											4.4E-07					--
										Total of Receptor Risks Across All Media	7.3E-07			Total of Receptor Hazards Across All Media		--

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	8.8E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-07	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	9.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-06	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-06	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-06	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.0E-05					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	3.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	7.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	3.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-06	7.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	5.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	7.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-07	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.6E-06					--
		Exposure Point Total									1.4E-05					--
	Exposure Medium Total										1.4E-05					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	5.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.5E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	5.3E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.9E-11	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	8.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.5E-12	1.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	1.1E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.3E-11	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								8.7E-11					--
		Exposure Point Total									8.7E-11					--
	Exposure Medium Total										8.7E-11					--
Medium Total											1.4E-05					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	3.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.4E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-05	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	2.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	6.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-07	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.5E-05					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	5.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	5.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.7E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	6.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.8E-07	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	1.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.3E-07	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.5E-06					--
		Exposure Point Total									2.1E-05					--
	Exposure Medium Total										2.1E-05					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	9.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.9E-12	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	8.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.8E-11	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	1.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	1.6E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.9E-11	3.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	3.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.0E-12	8.0E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-10					--
		Exposure Point Total									1.3E-10					--
	Exposure Medium Total										1.3E-10					--
Medium Total											2.1E-05					--
										Total of Receptor Risks Across All Media	3.4E-05			Total of Receptor Hazards Across All Media		--

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.4E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-06	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	2.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	3.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-07	4.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.5E-06					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	6.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	7.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.5E-08	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.6E-07					--
		Exposure Point Total									2.2E-06					--
	Exposure Medium Total										2.2E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	6.9E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.6E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	7.3E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.1E-11	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	1.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	1.5E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.8E-11	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-10					--
		Exposure Point Total									1.2E-10					--
	Exposure Medium Total										1.2E-10					--
Medium Total											2.2E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	3.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	2.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-06	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	4.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-07	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	9.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.2E-06					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.8E-08	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.8E-07	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-07	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	2.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-07	3.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	4.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-08	7.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-06					--
		Exposure Point Total									3.4E-06					--
	Exposure Medium Total										3.4E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	1.1E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.2E-10	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	1.4E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	2.2E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.6E-11	3.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	5.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.5E-12	8.0E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.8E-10					--
		Exposure Point Total									1.8E-10					--
	Exposure Medium Total										1.8E-10					--
Medium Total											3.4E-06					--
										Total of Receptor Risks Across All Media	5.6E-06			Total of Receptor Hazards Across All Media		--

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	1.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-10	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.1E-09	7.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-09	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-09	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-08					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	2.7E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-10	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	2.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-09	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	4.7E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.4E-10	3.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	5.9E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.3E-10	4.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.1E-09					--
		Exposure Point Total									1.5E-08					--
	Exposure Medium Total										1.5E-08					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-7	mg/m^3	1.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-11	7.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-7	mg/m^3	1.2E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-10	8.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.9E-7	mg/m^3	1.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-11	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-8	mg/m^3	2.4E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.9E-11	1.7E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.9E-10					--
		Exposure Point Total									1.9E-10					--
	Exposure Medium Total										1.9E-10					--
Medium Total											1.5E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-09	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-09	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	3.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-09	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	7.6E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-10	5.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-08					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	4.9E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-10	3.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	4.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-09	3.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	5.6E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.1E-10	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	8.5E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-10	5.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	2.0E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-10	1.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.7E-09					--
		Exposure Point Total									2.3E-08					--
	Exposure Medium Total										2.3E-08					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.0E-7	mg/m^3	2.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.2E-11	1.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-7	mg/m^3	1.8E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.9E-10	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.3E-7	mg/m^3	2.3E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.5E-11	1.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.5E-8	mg/m^3	3.4E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.1E-11	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.2E-8	mg/m^3	8.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.8E-12	5.6E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.9E-10					--
		Exposure Point Total									2.9E-10					--
	Exposure Medium Total										2.9E-10					--
Medium Total											2.3E-08					--
										Total of Receptor Risks Across All Media	3.8E-08			Total of Receptor Hazards Across All Media		--

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	8.3E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.0E-09	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	8.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.4E-08	6.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-08	1.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.4E-08					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	1.4E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	2.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-09	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	3.1E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-09	2.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-08					--
		Exposure Point Total									1.1E-07					--
	Exposure Medium Total										1.1E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	2.9E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-13	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	3.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.4E-12	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	5.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.6E-13	4.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	6.4E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.7E-13	5.0E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.1E-12					--
		Exposure Point Total									5.1E-12					--
	Exposure Medium Total										5.1E-12					--
Medium Total											1.1E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.7E-08	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	2.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-08	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	6.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-09	4.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-07					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	2.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-09	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	2.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-08	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-09	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	4.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-09	3.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	1.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-10	8.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.5E-08					--
		Exposure Point Total									1.7E-07					--
	Exposure Medium Total										1.7E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	5.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.8E-13	4.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	4.7E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.2E-12	3.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	6.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-13	4.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	9.2E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-12	7.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	2.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-13	1.7E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.7E-12					--
		Exposure Point Total									7.7E-12					--
	Exposure Medium Total										7.7E-12					--
Medium Total											1.7E-07					--
										Total of Receptor Risks Across All Media	2.8E-07			Total of Receptor Hazards Across All Media		--

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	2.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-09	6.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	2.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-08	6.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	4.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.4E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	5.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.3E-09	1.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-08					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	1.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.7E-10	2.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.2E-09	2.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-09	4.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-09	5.4E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-08					--
		Exposure Point Total									4.2E-08					--
	Exposure Medium Total										4.2E-08					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	1.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-14	3.4E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	1.5E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-13	3.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	2.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-14	5.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	3.2E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.8E-14	7.4E-14	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.5E-13					--
		Exposure Point Total									2.5E-13					--
	Exposure Medium Total										2.5E-13					--
Medium Total											4.2E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	4.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	4.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.1E-08	9.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	5.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-09	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	8.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-09	1.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	2.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-09	4.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.6E-08					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	1.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-09	4.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	3.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-09	5.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	3.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-09	7.7E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	7.8E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.7E-10	1.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-08					--
		Exposure Point Total									6.4E-08					--
	Exposure Medium Total										6.4E-08					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.6E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.9E-14	6.1E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	2.3E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.6E-13	5.4E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	3.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-14	7.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	4.5E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.5E-14	1.1E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	1.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-14	2.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.8E-13					--
		Exposure Point Total									3.8E-13					--
	Exposure Medium Total										3.8E-13					--
Medium Total											6.4E-08					--
										Total of Receptor Risks Across All Media	1.1E-07			Total of Receptor Hazards Across All Media		--

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	6.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.8E-09	3.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	7.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-08	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.4E-09	6.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-08	7.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.5E-08					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	2.3E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-09	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	2.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-08	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	3.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-09	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	5.0E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-09	2.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.6E-08					--
		Exposure Point Total									1.0E-07					--
	Exposure Medium Total										1.0E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	1.3E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-14	6.7E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	1.3E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.5E-13	7.2E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	2.2E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-14	1.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	2.8E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.3E-14	1.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-13					--
		Exposure Point Total									2.2E-13					--
	Exposure Medium Total										2.2E-13					--
Medium Total											1.0E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-09	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.7E-08	5.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	7.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	2.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-08	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	4.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-09	2.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-07					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	4.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-09	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	3.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-08	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	4.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.4E-09	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	7.1E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-09	3.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	1.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-09	9.0E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.9E-08					--
		Exposure Point Total									1.5E-07					--
	Exposure Medium Total										1.5E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.0E-10	mg/m^3	2.3E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.5E-14	1.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	2.0E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.2E-13	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.3E-10	mg/m^3	2.6E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-14	1.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	3.9E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.7E-14	2.1E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.3E-11	mg/m^3	9.2E-14	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-14	4.9E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.3E-13					--
		Exposure Point Total									3.3E-13					--
	Exposure Medium Total										3.3E-13					--
Medium Total											1.5E-07					--
										Total of Receptor Risks Across All Media	2.6E-07			Total of Receptor Hazards Across All Media		--

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	6.0E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-10	3.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	6.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.7E-09	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-10	6.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	1.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.6E-10	8.4E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.8E-09					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	2.8E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-10	1.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	3.0E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-09	1.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	4.9E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-10	3.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	6.2E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.5E-10	4.0E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.2E-09					--
		Exposure Point Total									1.0E-08					--
	Exposure Medium Total										1.0E-08					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	1.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-14	6.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	1.1E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.2E-13	7.2E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	1.8E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.0E-14	1.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	2.3E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.8E-14	1.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.8E-13					--
		Exposure Point Total									1.8E-13					--
	Exposure Medium Total										1.8E-13					--
Medium Total											1.0E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-10	6.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	9.6E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.0E-09	6.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	1.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.0E-10	7.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	1.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-09	1.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	4.4E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.2E-10	2.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.0E-08					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	5.1E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-10	3.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	4.5E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-09	2.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	5.8E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-10	3.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	8.9E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.5E-10	5.6E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	2.1E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-10	1.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.9E-09					--
		Exposure Point Total									1.5E-08					--
	Exposure Medium Total										1.5E-08					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.9E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-14	1.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	1.7E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.9E-13	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	2.2E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-14	1.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	3.3E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.0E-14	2.1E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	7.8E-14	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.6E-15	5.0E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.8E-13					--
		Exposure Point Total									2.8E-13					--
	Exposure Medium Total										2.8E-13					--
Medium Total											1.5E-08					--
										Total of Receptor Risks Across All Media	2.5E-08			Total of Receptor Hazards Across All Media		--

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-08	6.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	2.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-07	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-06					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	1.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	9.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	3.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-08	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	3.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-08	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-07					--
		Exposure Point Total									1.6E-06					--
	Exposure Medium Total										1.6E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	1.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-12	7.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.6E-11	7.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	2.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	3.0E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.6E-12	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.4E-11					--
		Exposure Point Total									2.4E-11					--
	Exposure Medium Total										2.4E-11					--
Medium Total											1.6E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	2.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-06	1.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	3.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-07	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	8.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-08	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-06					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	3.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	2.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-07	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	3.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-08	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	5.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.0E-08	2.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	1.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-09	6.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-07					--
		Exposure Point Total									2.4E-06					--
	Exposure Medium Total										2.4E-06					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.4E-11	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	2.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-12	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	4.3E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.1E-12	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	1.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-12	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.6E-11					--
		Exposure Point Total									3.6E-11					--
	Exposure Medium Total										3.6E-11					--
Medium Total											2.4E-06					--
										Total of Receptor Risks Across All Media	3.9E-06			Total of Receptor Hazards Across All Media		--

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.150	mg/kg	1.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-09	6.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.4E-08	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	2.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-08	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-07					--
			Dermal	Benzo(a)anthracene	0.150	mg/kg	1.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-09	1.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.160	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.260	mg/kg	2.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-09	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.033	mg/kg	3.5E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-09	2.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-08					--
		Exposure Point Total									1.4E-07					--
	Exposure Medium Total										1.4E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	1.1E-10	mg/m^3	1.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-12	7.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.2E-10	mg/m^3	1.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-11	7.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.0E-10	mg/m^3	2.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.2E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-11	mg/m^3	2.5E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.0E-12	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.0E-11					--
		Exposure Point Total									2.0E-11					--
	Exposure Medium Total										2.0E-11					--
Medium Total											1.4E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Ingestion	Benzo(a)anthracene	0.270	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	3.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-08	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	7.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-09	5.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-07					--
			Dermal	Benzo(a)anthracene	0.270	mg/kg	2.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-09	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.240	mg/kg	2.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-08	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.310	mg/kg	3.3E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-09	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.047	mg/kg	5.0E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.7E-09	3.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.110	mg/kg	1.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.6E-10	7.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.8E-08					--
		Exposure Point Total									2.1E-07					--
	Exposure Medium Total										2.1E-07					--
	Air	PCP Drip Tank	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.8E-10	mg/m^3	1.8E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.0E-11	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.4E-10	mg/m^3	2.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-12	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.6E-11	mg/m^3	3.6E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.3E-12	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	8.4E-11	mg/m^3	8.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.3E-13	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.0E-11					--
		Exposure Point Total									3.0E-11					--
	Exposure Medium Total										3.0E-11					--
Medium Total											2.1E-07					--
										Total of Receptor Risks Across All Media	3.6E-07			Total of Receptor Hazards Across All Media		--

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES

RAGS PART D TABLE 9

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.

Reasonable Maximum Exposures

Central Tendency Exposures

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	3E-09	--	1E-09	--	4E-09	NA	--	--	--	--
			Benzo(a)pyrene	3E-08	--	1E-08	--	4E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	5E-09	--	2E-09	--	7E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	7E-09	--	3E-09	--	9E-09	NA	--	--	--	--
			Chemical Total	5E-08	--	2E-08	--	7E-08		--	--	--	--
		Exposure Point Total						7E-08					--
	Exposure Medium Total							7E-08					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Benzo(a)pyrene	--	3E-10	--	--	3E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	4E-11	--	--	4E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	6E-11	--	--	6E-11	NA	--	--	--	--
			Chemical Total	--	4E-10	--	--	4E-10		--	--	--	--
		Exposure Point Total						4E-10					--
	Exposure Medium Total							4E-10					--
Medium Total								7E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	5E-09	--	2E-09	--	8E-09	NA	--	--	--	--
			Benzo(a)pyrene	5E-08	--	2E-08	--	7E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	6E-09	--	2E-09	--	9E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	9E-09	--	4E-09	--	1E-08	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2E-09	--	9E-10	--	3E-09	NA	--	--	--	--
			Chemical Total	7E-08	--	3E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	4E-11	--	--	4E-11	NA	--	--	--	--
			Benzo(a)pyrene	--	4E-10	--	--	4E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	5E-11	--	--	5E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	8E-11	--	--	8E-11	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Chemical Total	--	6E-10	--	--	6E-10		--	--	--	--
		Exposure Point Total						6E-10					--
	Exposure Medium Total							6E-10					--
Medium Total								1E-07					--
Receptor Total							Receptor Risk Total	2E-07				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	4E-08	--	3E-08	--	7E-08	NA	--	--	--	--
			Benzo(a)pyrene	4E-07	--	4E-07	--	8E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	7E-08	--	6E-08	--	1E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	8E-08	--	7E-08	--	2E-07	NA	--	--	--	--
			Chemical Total	6E-07	--	5E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								1E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	7E-08	--	6E-08	--	1E-07	NA	--	--	--	--
			Benzo(a)pyrene	6E-07	--	5E-07	--	1E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	8E-08	--	7E-08	--	1E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	2E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3E-08	--	2E-08	--	5E-08	NA	--	--	--	--
			Chemical Total	9E-07	--	8E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	7E-13	--	--	7E-13	NA	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								2E-06					--
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	8E-09	--	8E-09	--	2E-08	NA	--	--	--	--
			Benzo(a)pyrene	8E-08	--	8E-08	--	2E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	1E-08	--	3E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	2E-08	--	3E-08	NA	--	--	--	--
			Chemical Total	1E-07	--	1E-07	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	6E-14	--	--	6E-14	NA	--	--	--	--
			Benzo(a)pyrene	--	7E-13	--	--	7E-13	NA	--	--	--	--
			Benzo(b)fluoranthene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Chemical Total	--	1E-12	--	--	1E-12		--	--	--	--
		Exposure Point Total						1E-12					--
	Exposure Medium Total							1E-12					--
Medium Total								2E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-08	--	1E-08	--	3E-08	NA	--	--	--	--
			Benzo(a)pyrene	1E-07	--	1E-07	--	2E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	2E-08	--	2E-08	--	3E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	2E-08	--	5E-08	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6E-09	--	6E-09	--	1E-08	NA	--	--	--	--
			Chemical Total	2E-07	--	2E-07	--	4E-07		--	--	--	--
		Exposure Point Total						4E-07					--
	Exposure Medium Total							4E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Benzo(b)fluoranthene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	5E-14	--	--	5E-14	NA	--	--	--	--
			Chemical Total	--	2E-12	--	--	2E-12		--	--	--	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								4E-07					--
Receptor Total							Receptor Risk Total	6E-07				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	5E-08	--	4E-08	--	9E-08	NA	--	--	--	--
			Benzo(a)pyrene	5E-07	--	4E-07	--	9E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	8E-08	--	7E-08	--	2E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-07	--	9E-08	--	2E-07	NA	--	--	--	--
			Chemical Total	7E-07	--	6E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Chemical Total	--	2E-12	--	--	2E-12		--	--	--	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	9E-08	--	7E-08	--	2E-07	NA	--	--	--	--
			Benzo(a)pyrene	8E-07	--	7E-07	--	1E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-07	--	8E-08	--	2E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	3E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3E-08	--	3E-08	--	6E-08	NA	--	--	--	--
			Chemical Total	1E-06	--	1E-06	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	5E-13	--	--	5E-13	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Chemical Total	--	3E-12	--	--	3E-12		--	--	--	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								2E-06					--
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	7E-09	--	1E-08	--	2E-08	NA	--	--	--	--
			Benzo(a)pyrene	7E-08	--	1E-07	--	2E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	2E-08	--	3E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	3E-08	--	4E-08	NA	--	--	--	--
			Chemical Total	1E-07	--	2E-07	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	4E-13	--	--	4E-13	NA	--	--	--	--
			Chemical Total	--	3E-12	--	--	3E-12		--	--	--	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								3E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-08	--	2E-08	--	3E-08	NA	--	--	--	--
			Benzo(a)pyrene	1E-07	--	2E-07	--	3E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	2E-08	--	4E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	4E-08	--	6E-08	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	5E-09	--	8E-09	--	1E-08	NA	--	--	--	--
			Chemical Total	2E-07	--	3E-07	--	4E-07		--	--	--	--
		Exposure Point Total						4E-07					--
	Exposure Medium Total							4E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Benzo(a)pyrene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Benzo(b)fluoranthene	--	4E-13	--	--	4E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Chemical Total	--	4E-12	--	--	4E-12		--	--	--	--
		Exposure Point Total						4E-12					--
	Exposure Medium Total							4E-12					--
Medium Total								4E-07					--
Receptor Total							Receptor Risk Total	7E-07				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	5E-08	--	5E-08	--	1E-07					
			Benzo(a)pyrene	6E-07	--	6E-07	--	1E-06					
			Benzo(b)fluoranthene	9E-08	--	9E-08	--	2E-07					
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	2E-07					
			Chemical Total	9E-07	--	8E-07	--	2E-06					
		Exposure Point Total						2E-06					
	Exposure Medium Total							2E-06					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	3E-13	--	--	3E-13					
			Benzo(a)pyrene	--	3E-12	--	--	3E-12					
			Benzo(b)fluoranthene	--	6E-13	--	--	6E-13					
			Dibenzo(a,h)anthracene	--	8E-13	--	--	8E-13					
			Chemical Total	--	5E-12	--	--	5E-12					
		Exposure Point Total						5E-12					
	Exposure Medium Total							5E-12					
Medium Total								2E-06					
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-07	--	9E-08	--	2E-07					
			Benzo(a)pyrene	9E-07	--	8E-07	--	2E-06					
			Benzo(b)fluoranthene	1E-07	--	1E-07	--	2E-07					
			Dibenzo(a,h)anthracene	2E-07	--	2E-07	--	3E-07					
			Indeno(1,2,3-cd)pyrene	4E-08	--	4E-08	--	8E-08					
			Chemical Total	1E-06	--	1E-06	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	6E-13	--	--	6E-13					
			Benzo(a)pyrene	--	5E-12	--	--	5E-12					
			Benzo(b)fluoranthene	--	7E-13	--	--	7E-13					
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12					
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13					
			Chemical Total	--	8E-12	--	--	8E-12					
		Exposure Point Total						8E-12					
	Exposure Medium Total							8E-12					
Medium Total								3E-06					
Receptor Total							Receptor Risk Total	4E-06					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	6E-07	--	2E-07	--	9E-07	NA	--	--	--	--
			Benzo(a)pyrene	7E-06	--	2E-06	--	9E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-06	--	4E-07	--	2E-06	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-06	--	5E-07	--	2E-06	NA	--	--	--	--
			Chemical Total	1E-05	--	4E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	5E-12	--	--	5E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Chemical Total	--	9E-11	--	--	9E-11		--	--	--	--
		Exposure Point Total						9E-11					--
	Exposure Medium Total							9E-11					--
Medium Total								1E-05					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-06	--	4E-07	--	2E-06	NA	--	--	--	--
			Benzo(a)pyrene	1E-05	--	4E-06	--	1E-05	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-06	--	5E-07	--	2E-06	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-06	--	7E-07	--	3E-06	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	5E-07	--	2E-07	--	6E-07	NA	--	--	--	--
			Chemical Total	2E-05	--	6E-06	--	2E-05		--	--	--	--
		Exposure Point Total						2E-05					--
	Exposure Medium Total							2E-05					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Benzo(a)pyrene	--	9E-11	--	--	9E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	4E-12	--	--	4E-12	NA	--	--	--	--
			Chemical Total	--	1E-10	--	--	1E-10		--	--	--	--
		Exposure Point Total						1E-10					--
	Exposure Medium Total							1E-10					--
Medium Total								2E-05					--
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	9E-08	--	5E-08	--	1E-07	NA	--	--	--	--
			Benzo(a)pyrene	1E-06	--	5E-07	--	2E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	2E-07	--	8E-08	--	2E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-07	--	1E-07	--	3E-07	NA	--	--	--	--
			Chemical Total	1E-06	--	8E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	8E-12	--	--	8E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	8E-11	--	--	8E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Chemical Total	--	1E-10	--	--	1E-10		--	--	--	--
		Exposure Point Total						1E-10					--
	Exposure Medium Total							1E-10					--
Medium Total								2E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	2E-07	--	9E-08	--	3E-07	NA	--	--	--	--
			Benzo(a)pyrene	2E-06	--	8E-07	--	2E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	2E-07	--	1E-07	--	3E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	3E-07	--	2E-07	--	4E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	7E-08	--	4E-08	--	1E-07	NA	--	--	--	--
			Chemical Total	2E-06	--	1E-06	--	3E-06		--	--	--	--
		Exposure Point Total						3E-06					--
	Exposure Medium Total							3E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-10	--	--	1E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	3E-11	--	--	3E-11	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	6E-12	--	--	6E-12	NA	--	--	--	--
			Chemical Total	--	2E-10	--	--	2E-10		--	--	--	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
Medium Total								3E-06					--
Receptor Total							Receptor Risk Total	6E-06				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	7E-07	--	3E-07	--	1E-06					
			Benzo(a)pyrene	8E-06	--	3E-06	--	1E-05					
			Benzo(b)fluoranthene	1E-06	--	5E-07	--	2E-06					
			Dibenzo(a,h)anthracene	2E-06	--	6E-07	--	2E-06					
			Chemical Total	1E-05	--	4E-06	--	2E-05					
		Exposure Point Total						2E-05					
	Exposure Medium Total							2E-05					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-11	--	--	1E-11					
			Benzo(a)pyrene	--	1E-10	--	--	1E-10					
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11					
			Dibenzo(a,h)anthracene	--	3E-11	--	--	3E-11					
			Chemical Total	--	2E-10	--	--	2E-10					
		Exposure Point Total						2E-10					
	Exposure Medium Total							2E-10					
Medium Total								2E-05					
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-06	--	5E-07	--	2E-06					
			Benzo(a)pyrene	1E-05	--	5E-06	--	2E-05					
			Benzo(b)fluoranthene	2E-06	--	6E-07	--	2E-06					
			Dibenzo(a,h)anthracene	2E-06	--	9E-07	--	3E-06					
			Indeno(1,2,3-cd)pyrene	5E-07	--	2E-07	--	7E-07					
			Chemical Total	2E-05	--	7E-06	--	2E-05					
		Exposure Point Total						2E-05					
	Exposure Medium Total							2E-05					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-11	--	--	2E-11					
			Benzo(a)pyrene	--	2E-10	--	--	2E-10					
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11					
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11					
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11					
			Chemical Total	--	3E-10	--	--	3E-10					
		Exposure Point Total						3E-10					
	Exposure Medium Total							3E-10					
Medium Total								2E-05					
Receptor Total							Receptor Risk Total	4E-05					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	8E-10	--	2E-10	--	1E-09	NA	--	--	--	--
			Benzo(a)pyrene	8E-09	--	2E-09	--	1E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-09	--	3E-10	--	2E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-09	--	4E-10	--	2E-09	NA	--	--	--	--
			Chemical Total	1E-08	--	3E-09	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-10	--	--	1E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	3E-11	--	--	3E-11	NA	--	--	--	--
			Chemical Total	--	2E-10	--	--	2E-10		--	--	--	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
Medium Total								2E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-09	--	4E-10	--	2E-09	NA	--	--	--	--
			Benzo(a)pyrene	1E-08	--	3E-09	--	2E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	2E-09	--	4E-10	--	2E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-09	--	6E-10	--	3E-09	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6E-10	--	1E-10	--	7E-10	NA	--	--	--	--
			Chemical Total	2E-08	--	5E-09	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	9E-12	--	--	9E-12	NA	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		--	--	--	--
		Exposure Point Total						3E-10					--
	Exposure Medium Total							3E-10					--
Medium Total								2E-08					--
Receptor Total							Receptor Risk Total	4E-08				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	6E-09	--	1E-09	--	7E-09	NA	--	--	--	--
			Benzo(a)pyrene	6E-08	--	1E-08	--	8E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	2E-09	--	1E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-08	--	2E-09	--	2E-08	NA	--	--	--	--
			Chemical Total	9E-08	--	2E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Benzo(a)pyrene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Benzo(b)fluoranthene	--	6E-13	--	--	6E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	8E-13	--	--	8E-13	NA	--	--	--	--
			Chemical Total	--	5E-12	--	--	5E-12		--	--	--	--
		Exposure Point Total						5E-12					--
	Exposure Medium Total							5E-12					--
Medium Total								1E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-08	--	2E-09	--	1E-08	NA	--	--	--	--
			Benzo(a)pyrene	1E-07	--	2E-08	--	1E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	2E-09	--	1E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	3E-09	--	2E-08	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4E-09	--	8E-10	--	5E-09	NA	--	--	--	--
			Chemical Total	1E-07	--	2E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	6E-13	--	--	6E-13	NA	--	--	--	--
			Benzo(a)pyrene	--	5E-12	--	--	5E-12	NA	--	--	--	--
			Benzo(b)fluoranthene	--	7E-13	--	--	7E-13	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Chemical Total	--	8E-12	--	--	8E-12		--	--	--	--
		Exposure Point Total						8E-12					--
	Exposure Medium Total							8E-12					--
Medium Total								2E-07					--
Receptor Total							Receptor Risk Total	3E-07				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	2E-09	--	8E-10	--	3E-09	NA	--	--	--	--
			Benzo(a)pyrene	2E-08	--	8E-09	--	3E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	3E-09	--	1E-09	--	5E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	4E-09	--	2E-09	--	6E-09	NA	--	--	--	--
			Chemical Total	3E-08	--	1E-08	--	4E-08		--	--	--	--
		Exposure Point Total						4E-08					--
	Exposure Medium Total							4E-08					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-14	--	--	3E-14	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	4E-14	--	--	4E-14	NA	--	--	--	--
			Chemical Total	--	3E-13	--	--	3E-13		--	--	--	--
		Exposure Point Total						3E-13					--
	Exposure Medium Total							3E-13					--
Medium Total								4E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	3E-09	--	1E-09	--	5E-09	NA	--	--	--	--
			Benzo(a)pyrene	3E-08	--	1E-08	--	4E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	4E-09	--	2E-09	--	6E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	6E-09	--	2E-09	--	9E-09	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1E-09	--	6E-10	--	2E-09	NA	--	--	--	--
			Chemical Total	5E-08	--	2E-08	--	6E-08		--	--	--	--
		Exposure Point Total						6E-08					--
	Exposure Medium Total							6E-08					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	3E-14	--	--	3E-14	NA	--	--	--	--
			Benzo(a)pyrene	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-14	--	--	3E-14	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	5E-14	--	--	5E-14	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	1E-14	--	--	1E-14	NA	--	--	--	--
			Chemical Total	--	4E-13	--	--	4E-13		--	--	--	--
		Exposure Point Total						4E-13					--
	Exposure Medium Total							4E-13					--
Medium Total								6E-08					--
Receptor Total							Receptor Risk Total	1E-07				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	5E-09	--	2E-09	--	6E-09	NA	--	--	--	--
			Benzo(a)pyrene	5E-08	--	2E-08	--	7E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	8E-09	--	3E-09	--	1E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-08	--	4E-09	--	1E-08	NA	--	--	--	--
			Chemical Total	8E-08	--	3E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-14	--	--	1E-14	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	3E-14	--	--	3E-14	NA	--	--	--	--
			Chemical Total	--	2E-13	--	--	2E-13		--	--	--	--
		Exposure Point Total						2E-13					--
	Exposure Medium Total							2E-13					--
Medium Total								1E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	9E-09	--	3E-09	--	1E-08	NA	--	--	--	--
			Benzo(a)pyrene	8E-08	--	3E-08	--	1E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	3E-09	--	1E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	5E-09	--	2E-08	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4E-09	--	1E-09	--	5E-09	NA	--	--	--	--
			Chemical Total	1E-07	--	4E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-14	--	--	3E-14	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	5E-14	--	--	5E-14	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	1E-14	--	--	1E-14	NA	--	--	--	--
			Chemical Total	--	3E-13	--	--	3E-13		--	--	--	--
		Exposure Point Total						3E-13					--
	Exposure Medium Total							3E-13					--
Medium Total								2E-07					--
Receptor Total							Receptor Risk Total	3E-07				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	4E-10	--	2E-10	--	6E-10	NA	--	--	--	--
			Benzo(a)pyrene	5E-09	--	2E-09	--	7E-09	NA	--	--	--	--
			Benzo(b)fluoranthene	8E-10	--	4E-10	--	1E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-09	--	5E-10	--	1E-09	NA	--	--	--	--
			Chemical Total	7E-09	--	3E-09	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-14	--	--	1E-14	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	3E-14	--	--	3E-14	NA	--	--	--	--
			Chemical Total	--	2E-13	--	--	2E-13		--	--	--	--
		Exposure Point Total						2E-13					--
	Exposure Medium Total							2E-13					--
Medium Total								1E-08					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	8E-10	--	4E-10	--	1E-09	NA	--	--	--	--
			Benzo(a)pyrene	7E-09	--	3E-09	--	1E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	9E-10	--	4E-10	--	1E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-09	--	6E-10	--	2E-09	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3E-10	--	2E-10	--	5E-10	NA	--	--	--	--
			Chemical Total	1E-08	--	5E-09	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	4E-14	--	--	4E-14	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	9E-15	--	--	9E-15	NA	--	--	--	--
			Chemical Total	--	3E-13	--	--	3E-13		--	--	--	--
		Exposure Point Total						3E-13					--
	Exposure Medium Total							3E-13					--
Medium Total								2E-08					--
Receptor Total							Receptor Risk Total	3E-08				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	5E-09	--	2E-09	--	7E-09					
			Benzo(a)pyrene	6E-08	--	2E-08	--	8E-08					
			Benzo(b)fluoranthene	9E-09	--	3E-09	--	1E-08					
			Dibenzo(a,h)anthracene	1E-08	--	4E-09	--	2E-08					
			Chemical Total	8E-08	--	3E-08	--	1E-07					
		Exposure Point Total						1E-07					
	Exposure Medium Total							1E-07					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	3E-14	--	--	3E-14					
			Benzo(a)pyrene	--	3E-13	--	--	3E-13					
			Benzo(b)fluoranthene	--	4E-14	--	--	4E-14					
			Dibenzo(a,h)anthracene	--	6E-14	--	--	6E-14					
			Chemical Total	--	4E-13	--	--	4E-13					
		Exposure Point Total						4E-13					
	Exposure Medium Total							4E-13					
Medium Total								1E-07					
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	9E-09	--	3E-09	--	1E-08					
			Benzo(a)pyrene	8E-08	--	3E-08	--	1E-07					
			Benzo(b)fluoranthene	1E-08	--	4E-09	--	1E-08					
			Dibenzo(a,h)anthracene	2E-08	--	6E-09	--	2E-08					
			Indeno(1,2,3-cd)pyrene	4E-09	--	1E-09	--	5E-09					
			Chemical Total	1E-07	--	4E-08	--	2E-07					
		Exposure Point Total						2E-07					
	Exposure Medium Total							2E-07					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	5E-14	--	--	5E-14					
			Benzo(a)pyrene	--	4E-13	--	--	4E-13					
			Benzo(b)fluoranthene	--	5E-14	--	--	5E-14					
			Dibenzo(a,h)anthracene	--	9E-14	--	--	9E-14					
			Indeno(1,2,3-cd)pyrene	--	2E-14	--	--	2E-14					
			Chemical Total	--	6E-13	--	--	6E-13					
		Exposure Point Total						6E-13					
	Exposure Medium Total							6E-13					
Medium Total								2E-07					
Receptor Total							Receptor Risk Total	3E-07					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	9E-08	--	1E-08	--	1E-07	NA	--	--	--	--
			Benzo(a)pyrene	9E-07	--	1E-07	--	1E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	2E-07	--	2E-08	--	2E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-07	--	3E-08	--	2E-07	NA	--	--	--	--
			Chemical Total	1E-06	--	2E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	4E-12	--	--	4E-12	NA	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								2E-06					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	2E-07	--	2E-08	--	2E-07	NA	--	--	--	--
			Benzo(a)pyrene	1E-06	--	2E-07	--	2E-06	NA	--	--	--	--
			Benzo(b)fluoranthene	2E-07	--	3E-08	--	2E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	3E-07	--	4E-08	--	3E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6E-08	--	9E-09	--	7E-08	NA	--	--	--	--
			Chemical Total	2E-06	--	3E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	5E-12	--	--	5E-12	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Chemical Total	--	4E-11	--	--	4E-11		--	--	--	--
		Exposure Point Total						4E-11					--
	Exposure Medium Total							4E-11					--
Medium Total								2E-06					--
Receptor Total							Receptor Risk Total	4E-06				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	8E-09	--	1E-09	--	9E-09	NA	--	--	--	--
			Benzo(a)pyrene	8E-08	--	1E-08	--	1E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	2E-09	--	2E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	3E-09	--	2E-08	NA	--	--	--	--
			Chemical Total	1E-07	--	2E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		--	--	--	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								1E-07					--
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	1E-08	--	2E-09	--	2E-08	NA	--	--	--	--
			Benzo(a)pyrene	1E-07	--	2E-08	--	1E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	2E-08	--	2E-09	--	2E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	4E-09	--	3E-08	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6E-09	--	9E-10	--	7E-09	NA	--	--	--	--
			Chemical Total	2E-07	--	3E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	PCP Drip Tank	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Benzo(a)pyrene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Benzo(b)fluoranthene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	4E-12	--	--	4E-12	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	9E-13	--	--	9E-13	NA	--	--	--	--
			Chemical Total	--	3E-11	--	--	3E-11		--	--	--	--
		Exposure Point Total						3E-11					--
	Exposure Medium Total							3E-11					--
Medium Total								2E-07					--
Receptor Total							Receptor Risk Total	4E-07				Receptor HI Total	--

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	PCP Drip Tank	Benzo(a)anthracene	9E-08	--	1E-08	--	1E-07					
			Benzo(a)pyrene	1E-06	--	1E-07	--	1E-06					
			Benzo(b)fluoranthene	2E-07	--	2E-08	--	2E-07					
			Dibenzo(a,h)anthracene	2E-07	--	3E-08	--	2E-07					
			Chemical Total	1E-06	--	2E-07	--	2E-06					
		Exposure Point Total						2E-06					
	Exposure Medium Total							2E-06					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	3E-12	--	--	3E-12					
			Benzo(a)pyrene	--	1E-11	--	--	1E-11					
			Benzo(b)fluoranthene	--	4E-12	--	--	4E-12					
			Dibenzo(a,h)anthracene	--	5E-12	--	--	5E-12					
			Chemical Total	--	3E-11	--	--	3E-11					
		Exposure Point Total						3E-11					
	Exposure Medium Total							3E-11					
Medium Total								2E-06					
Subsurface Soil	Subsurface Soil	PCP Drip Tank	Benzo(a)anthracene	2E-07	--	2E-08	--	2E-07					
			Benzo(a)pyrene	2E-06	--	2E-07	--	2E-06					
			Benzo(b)fluoranthene	2E-07	--	3E-08	--	2E-07					
			Dibenzo(a,h)anthracene	3E-07	--	4E-08	--	3E-07					
			Indeno(1,2,3-cd)pyrene	7E-08	--	1E-08	--	8E-08					
			Chemical Total	2E-06	--	3E-07	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
	Air	PCP Drip Tank	Benzo(a)anthracene	--	5E-12	--	--	5E-12					
			Benzo(a)pyrene	--	4E-11	--	--	4E-11					
			Benzo(b)fluoranthene	--	6E-12	--	--	6E-12					
			Dibenzo(a,h)anthracene	--	9E-12	--	--	9E-12					
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12					
			Chemical Total	--	7E-11	--	--	7E-11					
		Exposure Point Total						7E-11					
	Exposure Medium Total							7E-11					
Medium Total								3E-06					
Receptor Total							Receptor Risk Total	4E-06					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

APPENDIX E.3

PROUCL OUTPUTS

Surface Soil

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	C:\Work Folders\Projects\Crane\PCP Drip Tank\Data\ProUCL Data - Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

DIBENZO(A,H)ANTHRACENE

General Statistics

Number of Valid Data	10	Number of Detected Data	3
Number of Distinct Detected Data	2	Number of Non-Detect Data	7
		Percent Non-Detects	70.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	24	Minimum Detected	3.178
Maximum Detected	52	Maximum Detected	3.951
Mean of Detected	33.33	Mean of Detected	3.436
SD of Detected	16.17	SD of Detected	0.446
Minimum Non-Detect	7	Minimum Non-Detect	1.946
Maximum Non-Detect	36	Maximum Non-Detect	3.584
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	90.00%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.75	Shapiro Wilk Test Statistic	0.75
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	14.18	Mean	2.139
SD	15.87	SD	1.041
95% DL/2 (t) UCL	23.38	95% H-Stat (DL/2) UCL	44.07
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	2.557
		SD in Log Scale	0.646
		Mean in Original Scale	16.22
		SD in Original Scale	14.07
		95% t UCL	24.38
		95% Percentile Bootstrap UCL	24.67
		95% BCA Bootstrap UCL	26.71
		95% H-UCL	26.91

DIBENZO(A,H)ANTHRACENE (Continued)

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	N/A
Maximum	N/A
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
AppChi2	N/A
95% Gamma Approximate UCL	N/A
95% Adjusted Gamma UCL	N/A

Data Distribution Test with Detected Values Only	
Data do not follow a Discernable Distribution (0.05)	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	26.8
SD	8.4
SE of Mean	3.253
95% KM (t) UCL	32.76
95% KM (z) UCL	32.15
95% KM (jackknife) UCL	31.93
95% KM (bootstrap t) UCL	N/A
95% KM (BCA) UCL	29.6
95% KM (Percentile Bootstrap) UCL	52
95% KM (Chebyshev) UCL	40.98
97.5% KM (Chebyshev) UCL	47.12
99% KM (Chebyshev) UCL	59.17
Potential UCLs to Use	
95% KM (t) UCL	32.76
95% KM (% Bootstrap) UCL	52

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

General UCL Statistics for Full Data Sets	
User Selected Options	
From File	C:\Work Folders\Projects\Crane\PCP Drip Tank\Data\ProUCL Data - Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BENZO(A)ANTHRACENE

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10

Raw Statistics		**Log-transformed Statistics**	
Minimum	11	Minimum of Log Data	2.398
Maximum	280	Maximum of Log Data	5.635
Mean	85.4	Mean of log Data	4.106
Median	59.5	SD of log Data	0.896
SD	78.86		
Std. Error of Mean	24.94		
Coefficient of Variation	0.923		
Skewness	1.923		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.793	Shapiro Wilk Test Statistic	0.977
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	131.1	95% H-UCL	215
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	197
95% Adjusted-CLT UCL (Chen-1995)	142.6	97.5% Chebyshev (MVUE) UCL	245
95% Modified-t UCL (Johnson-1978)	133.6	99% Chebyshev (MVUE) UCL	339.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.193	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	71.56		
MLE of Mean	85.4		
MLE of Standard Deviation	78.17		
nu star	23.87		
Approximate Chi Square Value (.05)	13.75	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	126.4
Adjusted Chi Square Value	12.43	95% Jackknife UCL	131.1
		95% Standard Bootstrap UCL	123.7
Anderson-Darling Test Statistic	0.288	95% Bootstrap-t UCL	170
Anderson-Darling 5% Critical Value	0.738	95% Hall's Bootstrap UCL	299
Kolmogorov-Smirnov Test Statistic	0.21	95% Percentile Bootstrap UCL	125.6
Kolmogorov-Smirnov 5% Critical Value	0.271	95% BCA Bootstrap UCL	147.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	194.1
		97.5% Chebyshev(Mean, Sd) UCL	241.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	333.5
95% Approximate Gamma UCL	148.3		
95% Adjusted Gamma UCL	164		
Potential UCL to Use		Use 95% Approximate Gamma UCL	148.3

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

BENZO(A)PYRENE

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	7.3	Minimum of Log Data	1.988
Maximum	320	Maximum of Log Data	5.768
Mean	89.33	Mean of log Data	4.128
Median	67	SD of log Data	0.968
SD	87		
Std. Error of Mean	27.51		
Coefficient of Variation	0.974		
Skewness	2.409		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.718	Shapiro Wilk Test Statistic	0.917
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	139.8	95% H-UCL	263.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	223.2
95% Adjusted-CLT UCL (Chen-1995)	157	97.5% Chebyshev (MVUE) UCL	279.5
95% Modified-t UCL (Johnson-1978)	143.3	99% Chebyshev (MVUE) UCL	390.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.128	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	79.22		
MLE of Mean	89.33		
MLE of Standard Deviation	84.12		
nu star	22.55		
Approximate Chi Square Value (.05)	12.75	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	134.6
Adjusted Chi Square Value	11.49	95% Jackknife UCL	139.8
		95% Standard Bootstrap UCL	133.5
Anderson-Darling Test Statistic	0.423	95% Bootstrap-t UCL	201.4
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	328.5
Kolmogorov-Smirnov Test Statistic	0.196	95% Percentile Bootstrap UCL	139.7
Kolmogorov-Smirnov 5% Critical Value	0.271	95% BCA Bootstrap UCL	164.6
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	209.3
		97.5% Chebyshev(Mean, Sd) UCL	261.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	363.1
95% Approximate Gamma UCL	158		
95% Adjusted Gamma UCL	175.3		
Potential UCL to Use		Use 95% Approximate Gamma UCL	158

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

BENZO(B)FLUORANTHENE

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	15	Minimum of Log Data	2.708
Maximum	500	Maximum of Log Data	6.215
Mean	154.4	Mean of log Data	4.731
Median	135	SD of log Data	0.901
SD	132.5		
Std. Error of Mean	41.89		
Coefficient of Variation	0.858		
Skewness	2.229		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.753	Shapiro Wilk Test Statistic	0.903
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	231.2	95% H-UCL	407.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	371.2
95% Adjusted-CLT UCL (Chen-1995)	254.8	97.5% Chebyshev (MVUE) UCL	461.9
95% Modified-t UCL (Johnson-1978)	236.1	99% Chebyshev (MVUE) UCL	640.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.306	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	118.2		
MLE of Mean	154.4		
MLE of Standard Deviation	135.1		
nu star	26.13		
Approximate Chi Square Value (.05)	15.48	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	223.3
Adjusted Chi Square Value	14.07	95% Jackknife UCL	231.2
		95% Standard Bootstrap UCL	219.8
Anderson-Darling Test Statistic	0.433	95% Bootstrap-t UCL	301.1
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	530.7
Kolmogorov-Smirnov Test Statistic	0.223	95% Percentile Bootstrap UCL	230
Kolmogorov-Smirnov 5% Critical Value	0.27	95% BCA Bootstrap UCL	256.2
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	337
		97.5% Chebyshev(Mean, Sd) UCL	416
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	571.2
95% Approximate Gamma UCL	260.6		
95% Adjusted Gamma UCL	286.7		
Potential UCL to Use		Use 95% Approximate Gamma UCL	260.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Subsurface Soil

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	C:\Work Folders\Projects\Crane\PCP Drip Tank\Data\ProUCL Data - Subsurface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BENZO(A)ANTHRACENE

General Statistics

Number of Valid Data	10	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	6
		Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	26	Minimum Detected	3.258
Maximum Detected	640	Maximum Detected	6.461
Mean of Detected	292.5	Mean of Detected	4.909
SD of Detected	306.4	SD of Detected	1.622
Minimum Non-Detect	18	Minimum Non-Detect	2.89
Maximum Non-Detect	20.5	Maximum Non-Detect	3.02
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	60.00%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.859	Shapiro Wilk Test Statistic	0.853
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	122.9	Mean	3.332
SD	229.3	SD	1.649
95% DL/2 (t) UCL	255.8	95% H-Stat (DL/2) UCL	1335
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.676
		SD in Log Scale	3.045
		Mean in Original Scale	117.6
		SD in Original Scale	232.3
		95% t UCL	252.2
		95% Percentile Bootstrap UCL	245.5
		95% BCA Bootstrap UCL	283.1
		95% H-UCL	1812389

BENZO(A)ANTHRACENE (Continued)

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.36
Theta Star	811.9
nu star	2.882
A-D Test Statistic	0.468
5% A-D Critical Value	0.67
K-S Test Statistic	0.67
5% K-S Critical Value	0.405
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	640
Mean	117
Median	0.000001
SD	232.6
k star	0.12
Theta star	977.8
Nu star	2.393
AppChi2	0.218
95% Gamma Approximate UCL	1285
95% Adjusted Gamma UCL	N/A

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	132.6
SD	212.6
SE of Mean	77.64
95% KM (t) UCL	274.9
95% KM (z) UCL	260.3
95% KM (jackknife) UCL	256.4
95% KM (bootstrap t) UCL	236
95% KM (BCA) UCL	496
95% KM (Percentile Bootstrap) UCL	496
95% KM (Chebyshev) UCL	471
97.5% KM (Chebyshev) UCL	617.4
99% KM (Chebyshev) UCL	905.1
Potential UCLs to Use	
95% KM (t) UCL	274.9
95% KM (Percentile Bootstrap) UCL	496

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

BENZO(A)PYRENE

General Statistics

Number of Valid Data	10	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	6
		Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	22	Minimum Detected	3.091
Maximum Detected	540	Maximum Detected	6.292
Mean of Detected	253.5	Mean of Detected	4.784
SD of Detected	261.3	SD of Detected	1.607
Minimum Non-Detect	7.1	Minimum Non-Detect	1.96
Maximum Non-Detect	16	Maximum Non-Detect	2.773

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	4
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	60.00%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.851	Shapiro Wilk Test Statistic	0.86
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	104.2	Mean	2.805
SD	198.2	SD	1.952
95% DL/2 (t) UCL	219.1	95% H-Stat (DL/2) UCL	3449
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.626
		SD in Log Scale	2.872
		Mean in Original Scale	101.8
		SD in Original Scale	199.5
		95% t UCL	217.4
		95% Percentile Bootstrap UCL	207.5
		95% BCA Bootstrap UCL	244.3
		95% H-UCL	429818

BENZO(A)PYRENE (Continued)

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.364
Theta Star	695.6
nu star	2.916
A-D Test Statistic	0.465
5% A-D Critical Value	0.67
K-S Test Statistic	0.67
5% K-S Critical Value	0.405
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	540
Mean	101.4
Median	0.000001
SD	199.8
k star	0.12
Theta star	844.6
Nu star	2.401
AppChi2	0.22
95% Gamma Approximate UCL	1109
95% Adjusted Gamma UCL	N/A

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	114.6
SD	182.6
SE of Mean	66.69
95% KM (t) UCL	236.8
95% KM (z) UCL	224.3
95% KM (jackknife) UCL	219.9
95% KM (bootstrap t) UCL	197.7
95% KM (BCA) UCL	449
95% KM (Percentile Bootstrap) UCL	436
95% KM (Chebyshev) UCL	405.3
97.5% KM (Chebyshev) UCL	531.1
99% KM (Chebyshev) UCL	778.1
Potential UCLs to Use	
95% KM (t) UCL	236.8
95% KM (Percentile Bootstrap) UCL	436

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

BENZO(B)FLUORANTHENE

General Statistics

Number of Valid Data	10	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	6
		Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	28	Minimum Detected	3.332
Maximum Detected	690	Maximum Detected	6.537
Mean of Detected	327.5	Mean of Detected	5.028
SD of Detected	337.7	SD of Detected	1.624
Minimum Non-Detect	18	Minimum Non-Detect	2.89
Maximum Non-Detect	20.5	Maximum Non-Detect	3.02
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	60.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.842	Shapiro Wilk Test Statistic	0.851
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	136.9	Mean	3.38
SD	254.8	SD	1.701
95% DL/2 (t) UCL	284.6	95% H-Stat (DL/2) UCL	1768
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.809
		SD in Log Scale	3.033
		Mean in Original Scale	131.7
		SD in Original Scale	257.7
		95% t UCL	281.1
		95% Percentile Bootstrap UCL	267.2
		95% BCA Bootstrap UCL	306
		95% H-UCL	1877252

BENZO(B)FLUORANTHENE (Continued)

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.362
Theta Star	905.6
nu star	2.893
A-D Test Statistic	0.483
5% A-D Critical Value	0.67
K-S Test Statistic	0.67
5% K-S Critical Value	0.405
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	690
Mean	131
Median	0.000001
SD	258.1
k star	0.119
Theta star	1097
Nu star	2.388
AppChi2	0.217
95% Gamma Approximate UCL	1443
95% Adjusted Gamma UCL	N/A

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	147.8
SD	236.1
SE of Mean	86.21
95% KM (t) UCL	305.8
95% KM (z) UCL	289.6
95% KM (jackknife) UCL	284.4
95% KM (bootstrap t) UCL	253.2
95% KM (BCA) UCL	N/A
95% KM (Percentile Bootstrap) UCL	570
95% KM (Chebyshev) UCL	523.6
97.5% KM (Chebyshev) UCL	686.2
99% KM (Chebyshev) UCL	1006
Potential UCLs to Use	
95% KM (t) UCL	305.8
95% KM (Percentile Bootstrap) UCL	570

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

DIBENZO(A,H)ANTHRACENE

General Statistics

Number of Valid Data	10	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	7
		Percent Non-Detects	70.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	13	Minimum Detected	2.565
Maximum Detected	86	Maximum Detected	4.454
Mean of Detected	60	Mean of Detected	3.805
SD of Detected	40.78	SD of Detected	1.074
Minimum Non-Detect	7.1	Minimum Non-Detect	1.96
Maximum Non-Detect	16	Maximum Non-Detect	2.773

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	8
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	80.00%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.801	Shapiro Wilk Test Statistic	0.774
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	21.15	Mean	2.166
SD	33.02	SD	1.259
95% DL/2 (t) UCL	40.28	95% H-Stat (DL/2) UCL	89.48
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.46
		SD in Log Scale	1.698
		Mean in Original Scale	19.11
		SD in Original Scale	34.14
		95% t UCL	38.9
		95% Percentile Bootstrap UCL	36.01
		95% BCA Bootstrap UCL	42.96
		95% H-UCL	256.7

DIBENZO(A,H)ANTHRACENE (Continued)

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	N/A
Maximum	N/A
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
AppChi2	N/A
95% Gamma Approximate UCL	N/A
95% Adjusted Gamma UCL	N/A

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	27.1
SD	28.22
SE of Mean	10.93
95% KM (t) UCL	47.14
95% KM (z) UCL	45.08
95% KM (jackknife) UCL	71.22
95% KM (bootstrap t) UCL	37.81
95% KM (BCA) UCL	86
95% KM (Percentile Bootstrap) UCL	86
95% KM (Chebyshev) UCL	74.74
97.5% KM (Chebyshev) UCL	95.36
99% KM (Chebyshev) UCL	135.9
Potential UCLs to Use	
95% KM (t) UCL	47.14
95% KM (Percentile Bootstrap) UCL	86

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

INDENO(1,2,3-CD)PYRENE

General Statistics

Number of Valid Data	10	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	7
		Percent Non-Detects	70.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	21	Minimum Detected	3.045
Maximum Detected	240	Maximum Detected	5.481
Mean of Detected	137	Mean of Detected	4.512
SD of Detected	110.1	SD of Detected	1.292
Minimum Non-Detect	35	Minimum Non-Detect	3.555
Maximum Non-Detect	41	Maximum Non-Detect	3.714

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	8
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	2
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	80.00%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.99	Shapiro Wilk Test Statistic	0.888
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	54.65	Mean	3.427
SD	76.96	SD	0.966
95% DL/2 (t) UCL	99.26	95% H-Stat (DL/2) UCL	130.4
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	3.482
		SD in Log Scale	0.993
		Mean in Original Scale	56.79
		SD in Original Scale	76.21
		95% t UCL	101
		95% Percentile Bootstrap UCL	100.6
		95% BCA Bootstrap UCL	111.3
		95% H-UCL	147.9

INDENO(1,2,3-CD)PYRENE (Continued)

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	N/A
Maximum	N/A
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
AppChi2	N/A
95% Gamma Approximate UCL	N/A
95% Adjusted Gamma UCL	N/A

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	55.8
SD	72.45
SE of Mean	28.06
95% KM (t) UCL	107.2
95% KM (z) UCL	102
95% KM (jackknife) UCL	143.6
95% KM (bootstrap t) UCL	71.38
95% KM (BCA) UCL	240
95% KM (Percentile Bootstrap) UCL	240
95% KM (Chebyshev) UCL	178.1
97.5% KM (Chebyshev) UCL	231
99% KM (Chebyshev) UCL	335
Potential UCLs to Use	
95% KM (t) UCL	107.2
95% KM (Percentile Bootstrap) UCL	240

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

APPENDIX E.4

SAMPLE CALCULATIONS

CALCULATION WORKSHEET

CLIENT:	**JOB NUMBER:**	
NSA CRANE, CRANE, INDIANA	112G03137	
SUBJECT:		
CALCULATION OF PARTICULATE EMISSION FACTOR FOR CONSTRUCTION WORKERS		
BASED ON:		
Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, December 2002)		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

Equation 5-5
Derivation of the Particulate Emission Factor
Construction Scenario - Construction Worker

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times \Sigma VKT} \right]$$

Parameter/Definition (units)	Default
PEF_{sc}/subchronic road particulate emission factor (m^3/kg)	site-specific
Q/C_{sr}/ inverse of the ratio of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/m^2-s per kg/m^3)	23.02[a] (Equation 5-6)
F_D/dispersion correction factor (unitless)	0.185 (Appendix E)
T/total time over which construction occurs (s)	site-specific
A_R/surface area of contaminated road segment (m^2) L_R/length of road segment (ft) W_R/width of road segment (ft)	274.213 ($A_R = L_R \times W_R \times 0.092903 m^2/ft^2$)
W/mean vehicle weight (tons)	site-specific
p/number of days with at least 0.01 inches of precipitation (days/year)	site-specific (Exhibit 5-2)
ΣVKT/sum of fleet vehicle kilometers traveled during the exposure duration (km)	site-specific

[a] Assumes a 0.5 acre site

Fd	0.185	dispersion correction factor (unitless)	
T	4.32E+06	sec	3600 sec/hr x 8hr/day x 150 days/yr
A_R	274.213	m^2	
W	8	tons	
p	125	day/year	
VKT	202.5	km	30 vehicles x 0.045 km/day x 150 days
PEF =	**1.34E+06**	**m^3/kg**	

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciufani	**DATE:** 1/19/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion surface soil at SWMU 29.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.16	mg/kg	Chemical: Benzo(a)pyrene
IR	=	200	mg/day	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	15	kg	
AT	=	25,550	days	
CSFo	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciufani	**DATE:** 1/19/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_1 = \frac{0.16\ mg/kg \times 200\ mg/day \times 350\ days/year \times 2\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{15\ kg \times 25550\ days} \times 10$$

IEX_1 = 5.84E-07 mg/kg/day

$$IEX_2 = \frac{0.16\ mg/kg \times 200\ mg/day \times 350\ days/year \times 4\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{15\ kg \times 25550\ days} \times 3$$

IEX_2 = 3.51E-07 mg/kg/day

ILCR = (5.84E-07 mg/kg/day + 3.51E-07 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 6.8E-06

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciafani	**DATE:** 1/19/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from dermal contact with surface soil.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.16	mg/kg	Chemical: Benzo(a)pyrene
CF	=	1.0E-06	kg/mg	
SA	=	2,800	cm^2/day	
AF	=	0.2	mg/cm^2	
ABS	=	0.13		
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
AT	=	25,550	days	
CSFd	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{0.16\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 350\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

DEXc = 2.13E-07 mg/kg/day

$$DEXc = \frac{0.16\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 350\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

DEXc = 1.28E-07 mg/kg/day

ILCR = (2.13E-07 mg/kg/day + 1.28E-07 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 2.5E-06

CALCULATION WORKSHEET

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciufani	**DATE:** 1/19/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from inhalation of fugitive dust emissions from surface soil at SWMU 29.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24\ hours/day} \times ADAF$$

Where:

EC	=	estimated exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (hours)
ADAF	=	age-dependent adjustment factor
IUR	=	inhalation unit risk$((ug/mg)^{-1})$

RISKS:

ILCR = Exposure concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg

ASSUMPTIONS:

Cs	=	0.16	mg/kg	Chemical: Benzo(a)pyrene
PEF	=	1.32E+09	m3/kg	
Ca	=	1.22E-10	mg/m3	
ET	=	24	hr/day	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
ATc	=	25,550	days	
IUR	=	1.1E-03	$(ug/m3)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

EXAMPLE CARCINOGENIC CALCULATION

$$EC = \frac{1.22E\text{-}10\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 2\ years}{25550\ days \times 24\ hours/day} \times 10$$

EC = 3.33E-11 mg/m3

$$EC = \frac{1.22E\text{-}10\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 4\ years}{25550\ days \times 24\ hours/day} \times 3$$

EC = 2.00E-11 mg/m3

ILCR = (3.33E-11 mg/m3 + 2.00E-11 mg/m3) x 1.10E-03 (ug/m3)-1 x 1000 ug/mg

ILCR = 5.9E-11

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion surface soil at SWMU 29.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.16	mg/kg	Chemical: Benzo(a)pyrene
IR	=	100	mg/day	
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
AT	=	25,550	days	
CSFo	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_1 = \frac{0.16\ mg/kg \times 100\ mg/day \times 350\ days/year \times 10\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{70\ kg \times 25550\ days} \times 3$$

IEX_1 = 9.39E-08 mg/kg/day

$$IEX_2 = \frac{0.16\ mg/kg \times 100\ mg/day \times 350\ days/year \times 14\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{70\ kg \times 25550\ days} \times 1$$

IEX_2 = 4.38E-08 mg/kg/day

ILCR = (9.39E-08 mg/kg/day + 4.38E-08 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 1.0E-06

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from dermal contact with surface soil.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.16	mg/kg	Chemical: Benzo(a)pyrene
CF	=	1.0E-06	kg/mg	
SA	=	5,700	cm^2/day	
AF	=	0.07	mg/cm^2	
ABS	=	0.13		
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
BW	=	70	kg	
AT	=	25,550	days	
CSFd	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{0.16\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 5700\ cm2/day \times 0.07\ mg/cm2 \times 0.13 \times 350\ days/year \times 10\ years}{70\ kg \times 25550\ days} \times 3$$

DEXc = 4.87E-08 mg/kg/day

$$DEXc = \frac{0.16\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 5700\ cm2/day \times 0.07\ mg/cm2 \times 0.13 \times 350\ days/year \times 14\ years}{70\ kg \times 25550\ days} \times 1$$

DEXc = 2.27E-08 mg/kg/day

ILCR = (4.87E-08 mg/kg/day + 2.27E-08 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 5.2E-07

CALCULATION WORKSHEET

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 1/19/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from inhalation of fugitive dust emissions from surface soil at SWMU 29.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24\ hours/day} \times ADAF$$

Where:

EC	=	estimated exposure intake (mg/kg/day)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (hours)
ADAF	=	age-dependent adjustment factor
IURi	=	inhalation unit risk($(ug/mg)^{-1}$)

RISKS:

ILCR = Exposure concentration (mg/m3) x IUR (ug/m3)-1 x 1000 ug/mg

ASSUMPTIONS:

Cs	=	0.16	mg/kg	Chemical: Benzo(a)pyrene
PEF	=	1.32E+09	m3/kg	
Ca	=	1.22E-10	mg/m3	
ET	=	24	hr/day	
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
ATc	=	25,550	days	
IUR	=	1.1E-03	$(ug/m3)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSA CRANE, CRANE, INDIANA		**JOB NUMBER:** 112G03137
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Crofani	**DATE:** 1/19/2012

EXAMPLE CARCINOGENIC CALCULATION

$$EC = \frac{1.22E\text{-}10\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 10\ years}{25550\ days \times 24\ hours/day} \times 3$$

EC = 5.00E-11 mg/m3

$$EC = \frac{1.22E\text{-}10\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 14\ years}{25550\ days \times 24\ hours/day} \times 1$$

EC = 2.33E-11 mg/m3

ILCR = (5.00E-11 mg/m3 + 2.33E-11 mg/m3) x 1.10E-03 (ug/m3)-1 x 1000 ug/mg

ILCR = 8.1E-11

APPENDIX F

SUPPORTING DOCUMENTATION

FOR THE ECOLOGICAL RISK ASSESSMENT

APPENDIX F

CHEMICAL CLASS DESCRIPTIONS
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

This appendix presents a discussion of the different chemical classes detected at the site, including toxicity information, potential food chain and trophic transfer, and bioaccumulation potential.

Polynuclear Aromatic Hydocarbons

Polynuclear aromatic hydocarbons (PAHs) are a diverse group of compounds consisting of two or more substituted and unsubstituted polynuclear aromatic rings formed by the incomplete combustion of carbonaceous materials. PAHs are ubiquitous in the modern environment and are common constituents of coal tar, soot, vehicle exhaust, cigarette smoke, certain petroleum products, road tar, mineral oils, creosote, and many cooked foods. PAHs also are released to the environment through natural sources such as volcanoes and forest fires.

PAHs are transferred from surface water by volatilization and sorption to settling particles. The compounds are transformed in surface water by photooxidation, chemical oxidation, and microbial metabolism (ATSDR, 1989). In soil and sediments, microbial metabolism is the major process for degradation of PAHs (ATSDR, 1989). Although PAHs accumulate in terrestrial and aquatic plants, many organisms are able to metabolize and eliminate these compounds. Vertebrates can readily metabolize PAHs, but lower forms (insects and worms) cannot metabolize PAHs as quickly. However, food chain uptake does not appear to be a major exposure source to PAHs for aquatic animals (ATSDR, 1989).

PAHs vary substantially in their toxicity to aquatic organisms. In general, toxicity increases as molecular weight increases, with the exception of some high molecular weight PAHs that have low acute toxicity. Most species of aquatic organisms rapidly accumulate PAHs that occur at low concentrations in the ambient medium. However, uptake of PAHs is highly species-specific, it is higher in algae, mollusks, and other species that are incapable of metabolizing PAHs (Eisler, 1987). The ability of fish to metabolize PAHs may explain why benzo(a)pyrene is frequently not detected or is found at only very low levels in fish from environments heavily contaminated with PAHs (ATSDR, 1989).

References:

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Public Health Service. Atlanta, Georgia. October.

Eisler, Ronald. 1987. Polycyclic Aromatic Hydrocarbon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. US Department of Interior - Fish and Wildlife Service. Biological Report 85 (1.11). May

APPENDIX F

RECEPTOR PROFILES
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

The following sections present the receptor profiles for the representative herbivorous and invertivorous, receptors chosen for food chain modeling at SWMU 29. The majority of the information for the profiles was obtained from the Wildlife Exposure Factors Handbook (U.S. EPA, 1993). The data for the incidental soil ingestion rates were obtained from the U.S. EPA Ecological Soil Screening Guidance (U.S. EPA, 2005).

The food and water ingestion rates are listed in g/g (of body weight)-day on a wet weight basis but were converted to dry weight for the ERA using the exposure factors presented below. The home ranges are presented in hectares in U.S. EPA (1993) but were converted to acres by multiplying the number of hectares by 2.471. Also note that the estimated percent of soil in the diets are listed in dry weight.

Short-Tailed Shrew (*Blarina brevicauda*)

Shrews inhabit a wide variety of habitats and are common in areas with abundant vegetative cover. They need cool, moist habitats because of their high metabolic and water-loss rates. The short-tailed shrew is primarily carnivorous, eating insects and other invertebrates such as earthworms, slugs, and snails.

The adult body weight for the short-tailed shrew in various habitats ranged from 0.015 to 0.01921 kg with an average of 0.0169 kg. The listed food ingestion rates for shrews are between 0.43 and 0.96 g/g-day (wet-weight). The food ingestion rate in kg/day was calculated as shown on Table F.2. The food ingestion rate was then multiplied by 0.16 in the food chain model, which is the percent solids of worms (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (3% for conservative food chain model and 0.9% for the average food chain model) from U. S. EPA (2005). 3% is the 90^{th} percentile value and 0.9% is the 50^{th} percentile value from U. S. EPA (2005). The only available home range for the shrew (0. 9699 acres) was calculated using data from a tamarack bog in Manitoba (only value available).

American Woodcock (*Scolopax minor*)

Woodcocks inhabit both woodlands and abandoned fields, particularly those with rich and moderately to poorly drained loamy soils, which tend to support abundant earthworm populations. They feed primarily on invertebrates found in moist upland soils by probing the soil with their long prehensile-tipped bill. Earthworms are their preferred diet, but seeds and other plant matter may also be consumed.

The adult body weight for the woodcock ranges from 0.166 to 0.213 kg with an average of 0.190 kg. The

listed food ingestion rates for the woodcock are between 0.73 and 1.0 g/g-day (wet-weight). The food ingestion rate in kg/day was calculated as shown in Table F.2. The food ingestion rate was then multiplied by 0.16 in the food chain model, which is the percent solids of worms (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 16.4% for conservative food chain model and 6.4% for the average food chain model) from U. S. EPA (2005). 16.4% is the 90^{th} percentile value and 6.4% is the 50^{th} percentile value from U. S. EPA (2005).

The range of home range sizes for the woodcock is 7.66 to 182 acres with an average home range of 61 acres.

Meadow Vole (*Microtus pennsylvanicus*)

Meadow voles inhabit grassy fields, marshes, and bogs; however, they prefer fields with more grass, more cover, and fewer woody plants. They typically consume green succulent vegetation, sedges, seeds, roots, bark, fungi, insects, and animal matter. However, green succulent vegetation makes up the majority of their diet.

The adult body weight for the vole ranges from 0.0329 to 0.0391 kg with an average of 0.0366 kg. The only listed food ingestion rates for voles range from 0.30 to 0.35 g/g-day (wet-weight), with an average of 0.325 g/g-day. The food ingestion rate in kg/day was calculated as shown in Table F.6. The food ingestion rate was then multiplied by 0.15 in the food chain model, which is the percent solids of plant foliage (U.S. EPA, 2005), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 3.2% for conservative food chain model and 1.2% for the average food chain model) from U. S. EPA (2005). 3.2% is the 90^{th} percentile value and 1.2% is the 50^{th} percentile value from U. S. EPA (2005).

The range of home range sizes for the meadow vole is 0.0297 to 1.06 acres with an average home range of 0.16 acres.

Northern Bobwhite Quail (*Colinus virginianus*)

Quails inhabit grasslands, idle fields, pastures, and large clumps of grasses. Bobwhite quails forage in areas with open vegetation, some bare ground, and light litter. Seeds from weeds, woody plants, and

grasses comprise the majority of an adult's diet, although green vegetation has been found to dominate the diet of this species in winter in the southern areas of the United States.

The adult body weight for the bobwhite quail ranges from 0.162 to 0.186 kg with an average of 0.177 kg. The listed food ingestion rates for quails range from 0.067 to 0.093 g/g-day (wet-weight), with an average of 0.082 g/g-day. The food ingestion rate in kg/day was calculated as shown on Table F.2. The food ingestion rate was then multiplied by 0.15 in the food chain model, which is the percent solids of plant foliage (U.S. EPA, 2005), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 13.9% for conservative food chain model and 6.1% for the average food chain model) from U. S. EPA (2005). 13.9% is the 90^{th} percentile value and 6.1% is the 50^{th} percentile value for the mourning dove from U. S. EPA (2005).

The home range for the quail ranges from 16 to 41 acres with an average home range of 29 acres.

References:

Sample, B.E., M.S. Aplin, R.A. Efroymson, G.W., Suter II, and C.J.E. Welsh. 1997. Methods and Tools for Estimation of the Exposure of Terrestrial Wildlife to Contaminants. Oak Ridge National Laboratory. October. ORNL/TM-13391.

U.S. EPA (U.S. Environmental Protection Agency), 1993. Wildlife Exposure Factors Handbook. U.S. Environmental Protection Agency. Office of Research and Development. Washington, D.C. December 1993. EPA/600/R-93/187a.

U.S. EPA (U.S. Environmental Protection Agency), 2005. Ecological Soil Screening Level Guidance, Office of Emergency and Remedial Response. February

TABLE F.1

EXPOSURE PARAMETERS FOR THE TERRESTRIAL WILDLIFE MODEL
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Species/Exposure Inputs	Conservative Inputs		Average Inputs		Source
	Values	Units	Values	Units	
Meadow Vole					
Body Weight = BW	3.290E-02	kg	3.663E-02	kg	USEPA, 1993
Food Ingestion Rate = If	1.920E-03	kg/day	1.785E-03	kg/day	USEPA, 1993
Soil Ingestion Rate - Is	6.144E-05	kg/day	2.142E-05	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		1.640E-01	acres	USEPA, 1993
Short-Tailed Shrew					
Body Weight = BW	1.525E-02	kg	1.687E-02	kg	USEPA, 1993
Food Ingestion Rate = If	2.592E-03	kg/day	1.648E-03	kg/day	USEPA, 1993
Soil Ingestion Rate - Is	7.776E-05	kg/day	1.483E-05	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		9.700E-01	acres	USEPA, 1993
American Woodcock					
Body Weight = BW	1.660E-01	kg	1.895E-01	kg	USEPA, 1993
Food Ingestion Rate = If	3.032E-02	kg/day	2.526E-02	kg/day	USEPA, 1993
Soil Ingestion Rate - Is	4.972E-03	kg/day	1.617E-03	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		6.133E+01	acres	USEPA, 1993
Bobwhite Quail					
Body Weight = BW	1.620E-01	kg	1.770E-01	kg	USEPA, 1993
Food Ingestion Rate = If	1.640E-02	kg/day	1.440E-02	kg/day	USEPA, 1993
Soil Ingestion Rate - Is	2.280E-03	kg/day	8.784E-04	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		2.860E+01	acres	USEPA, 1993

The exposure factors were derived as presented in Appendix F Table F.2.

The soil ingestion rates were calculated by multiplying the food ingestion rates by the following incidental soil ingestion rates:

Receptor	Conservative	Average	Source
Bobwhite quail	13.9%	6.1%	1, 2
Meadow Vole	3.2%	1.2%	1
American woodcock	16.4%	6.4%	1
Short-tailed Shrew	3%	0.9%	1

1 - USEPA (U.S. Environmental Protection Agency), 2005. Ecological Soil Screening Level Guidance, Office of Emergency and Remedial Response. February.
2 - Based on the mourning dove.

TABLE F.2

CALCULATION OF EXPOSURE PARAMETERS FOR SURROGATE WILDLIFE RECEPTORS
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Exposure Parameters	Meadow Vole	Short-Tailed Shrew		American Woodcock	Bobwhite Quail	
Body Weights (g)	32.9	17.61	16.87	168	180	181
	39.1	17.33	15.58	209	168	183
	35.5	19.21	15.7	166	162	179
	39	17.4	15.25	212	175	175
				169	178	183.2
				213	179	185.5
					180	173
					162.8	180.4
Minimum	***32.9***	***15.25***		***166***	***162***	
Maximum	***39.1***	***19.21***		***213***	***186***	
Average	***36.6***	***16.87***		***190***	***177***	
Food Ingestion Rate (g/g-day) [1]	0.3	0.49	0.77	1.0	0.067	0.079
	0.35	0.62	0.55	0.77	0.072	0.093
		0.43	0.96	0.73	0.09	0.089
		0.52	0.54			
Minimum	***0.3***	***0.43***		***0.73***	***0.067***	
Maximum	***0.35***	***0.96***		***1.0***	***0.093***	
Average	***0.325***	***0.61***		***0.8***	***0.082***	
Food Ingestion Rate (kg/day)						
Conservative	***1.28E-02***	***1.62E-02***		***1.90E-01***	***1.64E-02***	
Average	***1.19E-02***	***1.03E-02***		***1.58E-01***	***1.44E-02***	
Conversion from wet weight to dry weight	***0.15*** [2]	***0.16*** [3]		***0.16*** [3]	***None*** [4]	
Home Range (Ha)	0.43 0.1	0.3925		4.5	7.6	
	0.02 0.04			32.4	16.7	
	0.01 0.03			3.1	6.4	
	0.01 0.01			73.6	15.6	
	0.04 0.06			10.5		
	0.02 0.03					
	0.05 0.08					
	0.06 0.06					
Minimum (acres)	***0.0297***	***0.97***		***7.7***	***16***	
Maximum (acres)	***1.06***	***0.97***		***182***	***41***	
Average (acres)	***0.16***	***0.97***		***61***	***29***	

Notes:
Source of data is U.S. EPA (1993). If values from several studies are available, they are given. The minimum, maximum, and average values are derived from these studies.

Footnotes:
(1) - Ingestion Rates (kg/day) (if more than 1 ingestion rate is available)
- Conservative value = Max Ingestion Rate (g/g-day) * Avg. Body Weight
- Average value = Avg. Ingestion Rate (g/g-day) * Avg. Body Weight

(2) - Percent solids in vegetation
(3) - Percent solids in earthworms
(4) - Food items on dry weight basis

APPENDIX F

BIOACCUMULATION FACTORS
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

This attachment presents the bioaccumulation factors (BAFs) that were used in the food chain models. The following source of BAFs was used in the ecological risk assessment:

- Plant and Soil Invertebrate BAFs: EPA Guidance for Developing Ecological Soil Screening Levels, Attachment 4-1 (USEPA, 2007).

Table F.3 presents the BAFs that were used in the food-chain models for the individual constituents that were detected at SWMU 29. Note that dry weight BAFs were used for this ERA.

The majority of the plant BAFs are regression equations that are used to calculate the tissue concentration from the soil concentration.

References

USEPA, 2007. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

TABLE F.3

BIOACCUMULATION FACTORS
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Chemical	Plant Bioaccumulation Factors			Earthworm Bioaccumulation Factors		
	Conservative	Average	Source	Conservative	Average	Source
PAHs						
Acenaphthene	EXP(-0.8556*LN(C)-5.562)		(1)	1.47E+00	1.47E+00	(1)
Anthracene	EXP(0.7784*LN(C)-0.9887)		(1)	2.42E+00	2.42E+00	(1)
Benzo(a)anthracene	EXP(0.5944*LN(C)-2.7078)		(1)	1.59E+00	1.59E+00	(1)
Benzo(a)pyrene	EXP(0.975*LN(C)-2.0615)		(1)	1.33E+00	1.33E+00	(1)
Benzo(b)fluoranthene	3.10E-01	3.10E-01	(1)	2.60E+00	2.60E+00	(1)
Benzo(g,h,i)perylene	EXP(1.1829*LN(C)-0.9313)		(1)	2.94E+00	2.94E+00	(1)
Benzo(k)fluoranthene	EXP(0.8595*LN(C)-2.1579)		(1)	2.60E+00	2.60E+00	(1)
Chrysene	EXP(0.5944*LN(C)-2.7078)		(1)	2.29E+00	2.29E+00	(1)
Dibenzo(a,h)anthracene	1.30E-01	1.30E-01	(1)	2.31E+00	2.31E+00	(1)
Fluoranthene	5.00E-01	5.00E-01	(1)	3.04E+00	3.04E+00	(1)
Fluorene	EXP(-0.8556*LN(C)-5.562)		(1)	9.57E+00	9.57E+00	(1)
Indeno(1,2,3-cd)pyrene	1.10E-01	1.10E-01	(1)	2.86E+00	2.86E+00	(1)
Phenanthrene	EXP(0.6203*LN(C)-0.1665)		(1)	1.72E+00	1.72E+00	(1)
Pyrene	7.20E-01	7.20E-01	(1)	1.75E+00	1.75E+00	(1)

1 - USEPA (2007). Several tissue concentration will be calculated using regression equations (where C is the soil concentration) from USEPA (2007), Attachment 4-1, Table 4B (for organics).

TABLE F.4

TOXICITY REFERENCE VALUES
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

PARAMETER	Mammal		Bird	
	NOAEL	LOAEL	NOAEL	LOAEL
POLYCYCLIC AROMATIC HYDROCARBONS				
Acenaphthene	65.6	356	2	20
Anthracene	65.6	356	2	20
Benzo(a)anthracene	0.615	38.4	2	20
Benzo(a)pyrene	0.615	38.4	2	20
Benzo(b)fluoranthene	0.615	38.4	2	20
Benzo(g,h,i)perylene	0.615	38.4	2	20
Benzo(k)fluoranthene	0.615	38.4	2	20
Chrysene	0.615	38.4	2	20
Dibenzo(a,h)anthracene	0.615	38.4	2	20
Fluoranthene	65.6	356	2	20
Fluorene	65.6	356	2	20
Indeno(1,2,3-cd)pyrene	0.615	38.4	2	20
Phenanthrene	65.6	356	2	20
Pyrene	0.615	38.4	2	20

Notes:
The sources of these NOAELS and LOAELS are presented in the table titled "Sources and Endpoints for NOAELS and LOAELS for Terrestrial Wildlife" in this appendix.

TABLE F.5

SOURCES AND ENDPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Parameters	Concentration (mg/kg-day)	Endpoint	Effect	Chronic/ Subchronic	Species	Primary Reference
PAHs						
7,12-Dimethylbenz(a)anthracene	20	LOAEL	systemic	chronic	nestling/starlings	Trust et al., 1994
7,12-Dimethylbenz(a)anthracene	2	NOAEL	systemic	chronic	nestling/starlings	Trust et al., 1994
High Molecular Weight PAHs	38.4	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007
High Molecular Weight PAHs	0.615	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007
Low Molecular Weight PAHs	356	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007
Low Molecular Weight PAHs	65.6	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007

Notes:

NOAEL = No Observed Adverse Effects Level

LOAEL = Lowest Observed Adverse Effects Level

The NOAELS and LOAELS for the following PAHs are based on the Low Molecular Weight PAH values: acenapthylene, acenaphthene, anthracene, fluoranthene, fluorene, phenanthrene, 2-methylnaphthalene, and naphthalene.

The NOAELS and LOAELS for the following PAHs are based on the High Molecular Weight PAH values: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, indeno(1,2,3-c,d)pyrene, and pyrene.

The NOAELS and LOAELS for the PAHs for birds were based on 7,12-dimethylbenz(a)anthracene.

REFERENCES FOR TABLE F.5
(SOURCES AND ENPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE)
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Trust, K.A., A. Fairbrother, and M.J. Hooper. 1994. Effects of 7,12-Dimethylbenz(a)anthracene on Immune Function and Mixed-Function Oxygenase Activity in the European Starling. Environ. Tox. And Chem., Vol. 13, No. 5, pp. 821-830.

U.S. EPA, 2007. Ecological Soil Screening Level for PAHs, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-78. June.

APPENDIX F

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil Concentrations (mg/kg)				Earthworm Bioaccumulation Factors		Earthworm Concentrations (mg/kg)		Plant Bioaccumulation Factors		Plant Concentrations (mg/kg)	
	Maximum Detection	Average of All Results	Average of Positive Results	Average [1]	Conservative	Average	Maximum Detection	Average	Conservative	Average	Maximum Detection	Average
SEMIVOLATILES												
ACENAPHTHENE	3.60E-02	1.60E-02	2.29E-02	1.60E-02	1.47E+00	1.47E+00	5.29E-02	2.35E-02	Regression equation from Eco SSL		6.60E-02	1.32E-01
ANTHRACENE	7.50E-02	2.69E-02	3.88E-02	2.69E-02	2.42E+00	2.42E+00	1.82E-01	6.51E-02	Regression equation from Eco SSL		4.95E-02	2.23E-02
BENZO(A)ANTHRACENE	2.80E-01	8.54E-02	8.54E-02	8.54E-02	1.59E+00	1.59E+00	4.45E-01	1.36E-01	Regression equation from Eco SSL		3.13E-02	1.54E-02
BENZO(A)PYRENE	3.20E-01	8.93E-02	8.93E-02	8.93E-02	1.33E+00	1.33E+00	4.26E-01	1.19E-01	Regression equation from Eco SSL		4.19E-02	1.21E-02
BENZO(B)FLUORANTHENE	5.00E-01	1.54E-01	1.54E-01	1.54E-01	2.60E+00	2.60E+00	1.30E+00	4.01E-01	3.10E-01	3.10E-01	1.55E-01	4.79E-02
BENZO(G,H,I)PERYLENE	1.80E-01	7.00E-02	7.68E-02	7.00E-02	2.94E+00	2.94E+00	5.29E-01	2.06E-01	Regression equation from Eco SSL		5.18E-02	1.69E-02
BENZO(K)FLUORANTHENE	1.50E-01	6.02E-02	6.59E-02	6.02E-02	2.60E+00	2.60E+00	3.90E-01	1.56E-01	Regression equation from Eco SSL		2.26E-02	1.03E-02
CHRYSENE	3.20E-01	9.99E-02	9.99E-02	9.99E-02	2.29E+00	2.29E+00	7.33E-01	2.29E-01	Regression equation from Eco SSL		3.39E-02	1.70E-02
DIBENZO(A,H)ANTHRACENE	5.20E-02	1.43E-02	3.33E-02	1.43E-02	2.31E+00	2.31E+00	1.20E-01	3.31E-02	1.30E-01	1.30E-01	6.76E-03	1.86E-03
FLUORANTHENE	5.40E-01	1.53E-01	1.53E-01	1.53E-01	3.04E+00	3.04E+00	1.64E+00	4.64E-01	5.00E-01	5.00E-01	2.70E-01	7.63E-02
FLUORENE	2.80E-02	1.33E-02	1.98E-02	1.33E-02	9.57E+00	9.57E+00	2.68E-01	1.27E-01	Regression equation from Eco SSL		8.19E-02	1.55E-01
INDENO(1,2,3-CD)PYRENE	1.50E-01	5.56E-02	5.98E-02	5.56E-02	2.86E+00	2.86E+00	4.29E-01	1.59E-01	1.10E-01	1.10E-01	1.65E-02	6.11E-03
PHENANTHRENE	3.90E-01	1.24E-01	1.24E-01	1.24E-01	1.72E+00	1.72E+00	6.71E-01	2.14E-01	Regression equation from Eco SSL		4.72E-01	2.32E-01
PYRENE	1.10E+00	3.07E-01	3.07E-01	3.07E-01	1.75E+00	1.75E+00	1.93E+00	5.37E-01	7.20E-01	7.20E-01	7.92E-01	2.21E-01

1 - If the average of all value is the greater than the maximum detection, the average of the positive detections was used as the average value.

APPENDIX F

MEADOW VOLE - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
SEMIVOLATILES									
ACENAPHTHENE	3.60E-02	6.60E-02	6.72E-05	3.85E-03	3.92E-03	6.56E+01	3.56E+02	5.98E-05	1.10E-05
ANTHRACENE	7.50E-02	4.95E-02	1.40E-04	2.89E-03	3.03E-03	6.56E+01	3.56E+02	4.62E-05	8.51E-06
BENZO(A)ANTHRACENE	2.80E-01	3.13E-02	5.23E-04	1.83E-03	2.35E-03	6.15E-01	3.84E+01	3.82E-03	6.12E-05
BENZO(A)PYRENE	3.20E-01	4.19E-02	5.98E-04	2.45E-03	3.04E-03	6.15E-01	3.84E+01	4.95E-03	7.92E-05
BENZO(B)FLUORANTHENE	5.00E-01	1.55E-01	9.34E-04	9.05E-03	9.98E-03	6.15E-01	3.84E+01	1.62E-02	2.60E-04
BENZO(G,H,I)PERYLENE	1.80E-01	5.18E-02	3.36E-04	3.02E-03	3.36E-03	6.15E-01	3.84E+01	5.47E-03	8.75E-05
BENZO(K)FLUORANTHENE	1.50E-01	2.26E-02	2.80E-04	1.32E-03	1.60E-03	6.15E-01	3.84E+01	2.60E-03	4.17E-05
CHRYSENE	3.20E-01	3.39E-02	5.98E-04	1.98E-03	2.57E-03	6.15E-01	3.84E+01	4.19E-03	6.70E-05
DIBENZO(A,H)ANTHRACENE	5.20E-02	6.76E-03	9.71E-05	3.95E-04	4.92E-04	6.15E-01	3.84E+01	7.99E-04	1.28E-05
FLUORANTHENE	5.40E-01	2.70E-01	1.01E-03	1.58E-02	1.68E-02	6.56E+01	3.56E+02	2.56E-04	4.71E-05
FLUORENE	2.80E-02	8.19E-02	5.23E-05	4.78E-03	4.83E-03	6.56E+01	3.56E+02	7.36E-05	1.36E-05
INDENO(1,2,3-CD)PYRENE	1.50E-01	1.65E-02	2.80E-04	9.63E-04	1.24E-03	6.15E-01	3.84E+01	2.02E-03	3.24E-05
PHENANTHRENE	3.90E-01	4.72E-01	7.28E-04	2.76E-02	2.83E-02	6.56E+01	3.56E+02	4.31E-04	7.94E-05
PYRENE	1.10E+00	7.92E-01	2.05E-03	4.62E-02	4.83E-02	6.15E-01	3.84E+01	7.85E-02	1.26E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.29E-02	kg
Food Ingestion Rate = (If)	1.92E-03	kg/day
Soil Ingestion Rate = (Is)	6.14E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX F

BOBWHITE QUAIL - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
SEMIVOLATILES									
ACENAPHTHENE	3.60E-02	6.60E-02	5.07E-04	6.68E-03	7.19E-03	2.00E+00	2.00E+01	3.6E-03	3.6E-04
ANTHRACENE	7.50E-02	4.95E-02	1.06E-03	5.02E-03	6.07E-03	2.00E+00	2.00E+01	3.0E-03	3.0E-04
BENZO(A)ANTHRACENE	2.80E-01	3.13E-02	3.94E-03	3.17E-03	7.11E-03	2.00E+00	2.00E+01	3.6E-03	3.6E-04
BENZO(A)PYRENE	3.20E-01	4.19E-02	4.50E-03	4.24E-03	8.74E-03	2.00E+00	2.00E+01	4.4E-03	4.4E-04
BENZO(B)FLUORANTHENE	5.00E-01	1.55E-01	7.04E-03	1.57E-02	2.27E-02	2.00E+00	2.00E+01	1.1E-02	1.1E-03
BENZO(G,H,I)PERYLENE	1.80E-01	5.18E-02	2.53E-03	5.25E-03	7.78E-03	2.00E+00	2.00E+01	3.9E-03	3.9E-04
BENZO(K)FLUORANTHENE	1.50E-01	2.26E-02	2.11E-03	2.29E-03	4.40E-03	2.00E+00	2.00E+01	2.2E-03	2.2E-04
CHRYSENE	3.20E-01	3.39E-02	4.50E-03	3.43E-03	7.93E-03	2.00E+00	2.00E+01	4.0E-03	4.0E-04
DIBENZO(A,H)ANTHRACENE	5.20E-02	6.76E-03	7.32E-04	6.84E-04	1.42E-03	2.00E+00	2.00E+01	7.1E-04	7.1E-05
FLUORANTHENE	5.40E-01	2.70E-01	7.60E-03	2.73E-02	3.49E-02	2.00E+00	2.00E+01	1.7E-02	1.7E-03
FLUORENE	2.80E-02	8.19E-02	3.94E-04	8.29E-03	8.68E-03	2.00E+00	2.00E+01	4.3E-03	4.3E-04
INDENO(1,2,3-CD)PYRENE	1.50E-01	1.65E-02	2.11E-03	1.67E-03	3.78E-03	2.00E+00	2.00E+01	1.9E-03	1.9E-04
PHENANTHRENE	3.90E-01	4.72E-01	5.49E-03	4.78E-02	5.33E-02	2.00E+00	2.00E+01	2.7E-02	2.7E-03
PYRENE	1.10E+00	7.92E-01	1.55E-02	8.02E-02	9.57E-02	2.00E+00	2.00E+01	4.8E-02	4.8E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.62E-01	kg
Food Ingestion Rate = (If)	1.64E-02	kg/day
Soil Ingestion Rate = (Is)	2.28E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX F

SHORT-TAILED SHREW - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
SEMIVOLATILES									
ACENAPHTHENE	3.60E-02	5.29E-02	1.84E-04	8.99E-03	9.18E-03	6.56E+01	3.56E+02	1.4E-04	2.6E-05
ANTHRACENE	7.50E-02	1.82E-01	3.82E-04	3.08E-02	3.12E-02	6.56E+01	3.56E+02	4.8E-04	8.8E-05
BENZO(A)ANTHRACENE	2.80E-01	4.45E-01	1.43E-03	7.57E-02	7.71E-02	6.15E-01	3.84E+01	1.3E-01	2.0E-03
BENZO(A)PYRENE	3.20E-01	4.26E-01	1.63E-03	7.23E-02	7.40E-02	6.15E-01	3.84E+01	1.2E-01	1.9E-03
BENZO(B)FLUORANTHENE	5.00E-01	1.30E+00	2.55E-03	2.21E-01	2.24E-01	6.15E-01	3.84E+01	3.6E-01	5.8E-03
BENZO(G,H,I)PERYLENE	1.80E-01	5.29E-01	9.18E-04	8.99E-02	9.09E-02	6.15E-01	3.84E+01	1.5E-01	2.4E-03
BENZO(K)FLUORANTHENE	1.50E-01	3.90E-01	7.65E-04	6.63E-02	6.71E-02	6.15E-01	3.84E+01	1.1E-01	1.7E-03
CHRYSENE	3.20E-01	7.33E-01	1.63E-03	1.25E-01	1.26E-01	6.15E-01	3.84E+01	2.1E-01	3.3E-03
DIBENZO(A,H)ANTHRACENE	5.20E-02	1.20E-01	2.65E-04	2.04E-02	2.07E-02	6.15E-01	3.84E+01	3.4E-02	5.4E-04
FLUORANTHENE	5.40E-01	1.64E+00	2.75E-03	2.79E-01	2.82E-01	6.56E+01	3.56E+02	4.3E-03	7.9E-04
FLUORENE	2.80E-02	2.68E-01	1.43E-04	4.55E-02	4.57E-02	6.56E+01	3.56E+02	7.0E-04	1.3E-04
INDENO(1,2,3-CD)PYRENE	1.50E-01	4.29E-01	7.65E-04	7.29E-02	7.37E-02	6.15E-01	3.84E+01	1.2E-01	1.9E-03
PHENANTHRENE	3.90E-01	6.71E-01	1.99E-03	1.14E-01	1.16E-01	6.56E+01	3.56E+02	1.8E-03	3.3E-04
PYRENE	1.10E+00	1.93E+00	5.61E-03	3.27E-01	3.33E-01	6.15E-01	3.84E+01	5.4E-01	8.7E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.53E-02	kg
Food Ingestion Rate = (If)	2.59E-03	kg/day
Soil Ingestion Rate = (Is)	7.78E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX F

AMERICAN WOODCOCK - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 29 PCP DIP TANK, BUILDING 56 AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
ACENAPHTHENE	3.60E-02	5.29E-02	1.08E-03	9.67E-03	1.07E-02	2.00E+00	2.00E+01	5.4E-03	5.4E-04
ANTHRACENE	7.50E-02	1.82E-01	2.25E-03	3.32E-02	3.54E-02	2.00E+00	2.00E+01	1.8E-02	1.8E-03
BENZO(A)ANTHRACENE	2.80E-01	4.45E-01	8.39E-03	8.13E-02	8.97E-02	2.00E+00	2.00E+01	4.5E-02	4.5E-03
BENZO(A)PYRENE	3.20E-01	4.26E-01	9.59E-03	7.77E-02	8.73E-02	2.00E+00	2.00E+01	4.4E-02	4.4E-03
BENZO(B)FLUORANTHENE	5.00E-01	1.30E+00	1.50E-02	2.37E-01	2.52E-01	2.00E+00	2.00E+01	1.3E-01	1.3E-02
BENZO(G,H,I)PERYLENE	1.80E-01	5.29E-01	5.39E-03	9.67E-02	1.02E-01	2.00E+00	2.00E+01	5.1E-02	5.1E-03
BENZO(K)FLUORANTHENE	1.50E-01	3.90E-01	4.49E-03	7.12E-02	7.57E-02	2.00E+00	2.00E+01	3.8E-02	3.8E-03
CHRYSENE	3.20E-01	7.33E-01	9.59E-03	1.34E-01	1.43E-01	2.00E+00	2.00E+01	7.2E-02	7.2E-03
DIBENZO(A,H)ANTHRACENE	5.20E-02	1.20E-01	1.56E-03	2.19E-02	2.35E-02	2.00E+00	2.00E+01	1.2E-02	1.2E-03
FLUORANTHENE	5.40E-01	1.64E+00	1.62E-02	3.00E-01	3.16E-01	2.00E+00	2.00E+01	1.6E-01	1.6E-02
FLUORENE	2.80E-02	2.68E-01	8.39E-04	4.89E-02	4.98E-02	2.00E+00	2.00E+01	2.5E-02	2.5E-03
INDENO(1,2,3-CD)PYRENE	1.50E-01	4.29E-01	4.49E-03	7.84E-02	8.29E-02	2.00E+00	2.00E+01	4.1E-02	4.1E-03
PHENANTHRENE	3.90E-01	6.71E-01	1.17E-02	1.23E-01	1.34E-01	2.00E+00	2.00E+01	6.7E-02	6.7E-03
PYRENE	1.10E+00	1.93E+00	3.30E-02	3.52E-01	3.85E-01	2.00E+00	2.00E+01	1.9E-01	1.9E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.66E-01	kg
Food Ingestion Rate = (If)	3.03E-02	kg/day
Soil Ingestion Rate = (Is)	4.97E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration